RAILROAD GAZETTE

FRIDAY, NOV. 17, 1893.

CONTENTS.

ILLUSTRATIONS:	PAGE
Cause of Defects Found in Steel Tires	830
The Block System on the New York Central	831
Balancing Slide Valve	832
The Second Track of the St. Gothard Railroad	833
Comparative Dimensions of Locomotives at the World's Fair	833
Echoes from the World's Fair	834
Comparative Prices of American and English Rails	835
Collisions in Chicago	835
Railroad Matters in Chicago	835
CONTRIBUTIONS:	
Location of Washout Plugs in Locomotive Fireboxes	829
Steam Gage Attachments	829
Suicide Clubs for Railroad Travelers	829
EDITORIALS:	
The Massachusetts Mileage Ticket Act	836
The Maximum Balance for Slide Valves	836
Collision on the Rock Island	837
Loss Due to Radiation from Steam Boilers	837
Slower Time Between New York and Boston	837
Annual Reports	838
EDITORIAL NOTES	836, 839
NEW PUBLICATIONS	839
TRADE CATALOGUES	839
GENERAL NEWS:	
Car Building	841
Bridge Building	841
Railroad Law	841
Meetings and Announcements	842
Personal	842
Elections and Appointments	843
Railroad Construction	843
General Railroad News	843
Traffic	844
MISCELLANEOUS:	
Technical	840
The Scrap Heap	841
The Future Railroad Track	829
Georgia Railroad Commissioners' Report	829
The 1,000-H. P. Electric Locomotive	830
Permanent Way and Rolling Stock	832
New Police Boat "Patrol," for New York Harbor	839

Contributions.

Location of Washout Plugs in Locomotive Fire Boxes.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In your last issue a correspondent, "A. Z.," states that, in examining the locomotives in the American exhibit at ahe Columbian Exposition, he met with several details of construction which differed somewhat from the ordinary and the explanation of which was not apparent. He specifies the case in which the washout plugs in the front end of one of the fire-boxes were located between the two lower rows of staybolts. I noticed the same case, and after investigating arrived at the following conclusions:

The locomotive in question was of the consolidation type, and the main driving axle was almost directly under the front end of the fire-box. The washout plugs in the back end were very near the mud ring, and two similar ones in the sides, near the back end, were also located near the mud ring. The ones in the front end were directly over the eccentrics and driving boxes, so that water running from them carrying grit and scale would wash these cutting particles into the wearing surfaces of the eccentrics and the main bearings and cause excessive wearing, which would result in quickly heating these parts when running. The water in the driving boxes would also float off the oil. The openings at the back end and sides were so located that water running from them could get at none of the wearing surfaces. The intention, then, seemed to be that the back plugs should be removed first, and that the front plugs should not be removed till the top of the water was below them, thus preventing the grit and scale getting to the wearing surfaces of the journals and eccentrics. The water supply on the road, for which this locomotive was built, produces very little scale, but there is a slimy mixture of sand and mud which settles in the boilers, but which is readily removed without much use of a hook.

Frequently on locomotives where the cleaning holes are directly above the driving boxes or eccentrics an apron is provided and so arranged that water and scale from such openings will be caught by it and conducted away from the wearing surfaces. The apron is placed just below the fire-box and extends several inches underneath the latter and its shape is such that the water is conducted forward and drops between the eccentrics.

B. Y.

Steam Gage Attachments.

TO THE EDITOR OF THE RAILROAD GAZETTE:

An editorial in the last issue of your paper indicated how steam gages, after being tested, or at other times, should be connected with the boiler, and stated that the man whose duty it is to test the gages should also attach them to the boiler. With your permission I would like to supplement those remarks with some observations on the attachments frequently used for steam gages and with general remarks on what ought to be used.

Frequently the siphon or U tube is very shallow and not deep enough to hold sufficient water to fill the tube of the gage, or if it does it is so shallow that most of the water runs out each time the boiler becomes cool, and on firing up again the gage is filled with steam first and will not register correctly thereafter. With such siphons it matters little who attaches the gage to the boiler; but the one responsible for the siphons being made in such shape should be instructed differently. Frequently the pipe connecting the gage with the boiler is bent on itself in the form of a circle, and this is a better form than the simple U tube. The best arrangement, however, is to give the pipe two complete bends; then if the man who tests the gages, or whoever attaches them to the boilers, is careful to fill such tubes with water before screwing on the gages, little trouble will be experienced with standard makes of gages.

Another point that is frequently overlooked is the proper location and support of the gages. I have seen gages attached to very short metallic stands, the latter being bolted direct to the boiler. This method is just as objectionable as the use of shallow siphons, because the heat radiating from the boiler, with that conducted by the short metallic stand to the gauge, raises the water in the spring tube to a high temperature, and the effect is the same as admitting steam to the tube direct from the boiler. If metallic stands are used there should be some material that is a poor conductor of heat placed between the gage and the stand to protect the former from the heat conducted by the latter. The location of the gage should be such as to protect it from the heat radiated directly from the boiler, or something should be inteposed between the two to accomplish the same purpose. These matters concerning steam gages are too often overlooked and good gages are frequently condemned on account of faulty connections with the boiler, or ignorance of the proper method of attaching the same. STEAM GAGE.

Suicide Clubs for Railroad Travelers

NASHUA, N. H., Nov. 13, 1893.

TO THE EDITOR OF THE RAILROAD GAZETTE:

There has been a recent contribution to the literature of safe railroading to which I think you should give more than a passing thought. Prof. Burt G. Wilder, of Cornell, has published in the New York *Tribune* a long and exhaustive plea for the protection of the traveling public from lingering deaths, in which he suggests that every car should be equipped with "a tin can of chloroform." This is indeed a step in the right direction. Doctor Wilder, however, does not go far enough. He should advocate the formation of suicide clubs in every town where instruction in the art of easy suicide may be obtained.

A law student was once asked by his instructor to define "justifiable homicide." The reply was, "when a man kills himself in self-defense." Up to the present time this has stood as good "curbstone law," but in the light of Doctor Wilder's paper and the horrible railroad accidents which have called it forth, suicide in self-defense seems to have become a dire necessity. In concluding his novel paper the Doctor asks: "What railroad president will lead the way in directing that every locomotive and passenger car on his line shall be furnished with concentrated mercy in the form of chloroform?" In the words of the immortal psalmist, "that's a corker!"

In a few days we shall read cards like this: "Doctor Carlamp will meet Commercial Travelers' clubs and instruct them in the art of self-destruction in case of railroad accident."--"Professor Openswitch will instruct railroad employees in the use of chloroform as a refrigerant and general quieter in the warmer accidents." "Carfire & Welldone, manufacturers of indestructible identification tags." This is the way by which the public are to be protected against such wholesale slaughters as have darkened the pages of railroad history during the past year.

Chloroform! Why not an axe or club in the hands of survivors? But why not, indeed, a general uprising of an indignant populace against that mysterious friend of railroad corporatioes, General Laxity? Why not a more practicable system of protection for the public? Why not a system of signals by which engineers may know if the track is not clear? Why not a lock on the deadly switch which will give the signal when opened, regardless of a confused switchman? Why not a complete overhauling of the signal service by the railroad commissioners in every state, so that the people who must travel can be assured of reasonable safety? Why not steam heat in place of stoves? Electricity in place of oil lamps? If the time has come when we must arm ourselves with chloroform so that we may burn more comfortably, it has also come for us to take the matter into our own hands and insist that we have the danger of burning in this world reduced to a minimum.

There is not, there cannot be, a plea which can justify delay for a single hour. The expense has stood in the way, but the public cares naught for this. If railroads do not charge enough so that they can guarantee practical safety, let them advance the rates. But let them not presume that the public will longer tolerate their antiquated systems of lighting, heating, signaling and switching which have cost nearly a thousand lives in one year. We know that there are comparatively inexpensive methods of signal protection which have been in use on roads like the Boston & Maine, and which have never made a mistake, practical systems for heating by steam instead of stoves, and we shall be heard from if the railroads do not soon investigate and adopt them. Which is the better way, to arm ourselves with a two-ounce bottle of "concentrated mercy" and go forth to die a stuffy death amid the discomfort and confusion of burning wrecks, or to arm ourselves with legislative clubs with which to "do up" the cohorts of General Laxity who show such disregard for human life?

For one I scorn the "chloroform idee," and demand that my chances of being "done through" by these rail road corporations may be prayerfully considered.

C. S. COLLINS, M. D.

[Where does the Doctor get his statistics to warrant him in saying that nearly 1,000 lives have been lost from train accidents in a single year? Our record showed for 1892, passengers, employees and others, 672. The last published report of the Interstate Commerce Commission shows for a year 676. But the record is bad enough. By all means let the railroads advance rates and give us more security. Of course the public will kick, but it kicks against being killed also.—EDITOR RAILROAD GAZETTE.]

The Future Railroad Track.

BY T. C. CLARKE, C. E.

The article in *Railroad Gazette* of Nov. 3, by Mr. Charles Paine, on continuously supported rails, especially illustrating the Haarmann-Victor system, is very interesting and suggestive. The writer, until a few months since, agreed with those who believe that continuously supported rails will eventually replace our present system. A careful examination and study of the continuous systems exhibited at Chicago has changed his opinion. While these systems have done goodwork in the past in carrying the lighter rolling stock, then in use here, and now generally in use in Europe, they are not steady enough to carry the heavier engines and cars even now in use, and with the certainty of increased weights in the future they could not be made strong enough nor give bearing enough, except at a prohibitive cost.

The writer's present views as to the best track are these:

Our track consists of three parts—the rail and its joints, the bearing-ties, and the attachments of the rails to the ties. All must work well to give a good track. No perfect joint has yet been devised. It seems to the writer that the Haarmann-Victor system, illustrated by Mr. Paine, has great promise. It should be laid on wooden cross-ties and could then be reduced in weight from 7½ in. base by 7½ in. high to 5 in. base, and 5½ in. or 6 in. high, and the weight from 127 to 100 lbs. per yard. The rails themselves are not difficult to roll, and their ends can be stamped into true shape. By rolling them in 60-ft. lengths the number of joints would be halved. Although this system is not theoretically as perfect as a compound rail of two parts it is free from the practical defects of that system and costs less.

The second part of the track is the ties, which really are bearers, and good bearers they are, but poor *ties* with our present fastenings. It will be many years before the price of metal will be so low, and that of lumber so high that wooden ties can be superseded by metallic ones. What we want is long ties, at least 10 ft. long, of large size, and placed as close together as will allow of proper tamping.

No metallic tie and no longitudinal system yet devised can give the amount of bearing and the grip on the ballast that such wood, bearing ties can give. They can be drained better than any longitudinal system and cost far less than any metallic cross-ties of equal bearing surface. They require the addition of two things, chemical treatment to prevent decay, and proper fastenings.

This brings us to the third point—fastenings. Tie plates, now so much used, are a long step in the right direction. They prevent tie cutting, and offer the resistance of four spikes instead of two. But spikes should be abandoned. On one of our trunk lines 30 per cent. of the destruction of its ties comes from the re-driving of the spikes, filling the tie with holes close together and preventing a good hold, also promoting decay from the admission of moisture and water.

The rail should rest on a tieplate and be electrically welded to it, and this tieplate should be held to the tie by at least four screw bolts.

Col. Katté, Chief Engineer of the N. Y. Central, has invented a screw bolt combined with a clip. By easing and tightening the screw bolts on opposite sides of the rail a slight movement can be given crosswise, and thus a very fine secondary alignment can be got, the primary alignment being made by moving the ties themselves sideways. The screws are never removed from the holes, and the integrity of the timber is preserved.

Should the Haarmann-Victor joint turn out well we should have in a track composed as above described—good joints, good bearing and drainage, durable ties, no spreading of rails. No track hitherto devised combines all these good qualities.

Georgia Railroad Commissioners' Report.

The twenty-first annual report of the Railroad Commission of Georgia has just been issued. It is for the year ending Oct. 15 last. It opens with a reference to the financial depression throughout the country, and the fact is recognized that in Georgia, as well as elsewhere, new railroads have been built in excess of the demand for them. It is held that the railroads of Georgia are not laboring under any greater depression than those of other states south of the Ohio River, and some of the troubles of the roads are not due to depression, but to legal complications arising from alleged violation of the law. The rate problem is discussed at some length,

and the action of the Commission in refusing to allow the roads to advance freight rates 25 per cent., as asked for by the managers early in the present year, is defended. It appears that an advance has been allowed on some commodities.

The express and telegraph companies have given satisfactory service during the past year. Complaints about demurrage on freight cars are now very few. The Commissioners have had considerable trouble in prescribing estimated weights for lumber, and recommend that the railroads take more pains to have accurate scales and to appoint sworn weighers.

The Commission reports with satisfaction that the United States court has sustained the rule requiring railroads in Georgia, in billing freight through from a point on one road to a point on another, to charge 10 per cent. less than the sum of the local rates. The Richmond & Danville, however, refuses to respect this rule. The decision of the United States court in the Social Circle case does not please the Commissioners so well, and they express gratification at the appeal taken by the Interstate Commerce Commission.

The total assessment of the railroads of Georgia for taxation is $36,521,534. The report ends with a recommendation concerning overcharges as follows:

"A person who has been overcharged should not be required to spend more money recovering the overcharge than the overcharge would amount to. The law already gives to a person the right to recover double the overcharge. To make this effective it should provide for making the railroads liable for attorney's fees and all costs and expenses. There shou'd be no overcharge, and if there is, make it more to the interest of the railroad not to do the shipper this wrong than to receive the excess. If they violate the law, they should suffer the penalty of their wrongdoing. It is believed that the enactment of such a law would prevent overcharge and avoid the wrong that is so discouraging and harassing to shippers and consignees."

The 1,000-Horse Power Electric Locomotive.

We regret very much to say that it seems probable that the completion of the 1,000 H. P. electric locomotive, designed by Messrs. Sprague, Duncan & Hutchinson, which was described in the *Railroad Gazette* of Oct. 13, is likely to be delayed a good while owing to the embarrassment of Mr. Villard and his associates. We regret this especially because it seemed to promise great and definite step in the development of electrical traction.

Causes of Defects Found in Steel Tires.*

As the result of numerous analyses and physical tests of defective and experimental tires made for the Standard Steel Works, the writers discovered the following facts concerning defects in tires which are the results of defects, such as piping and segregation, in the original ingot. It has been said:† "It may be fairly assumed that ordinary ingots are not seriously affected by the redistribution"—that is, segregation, of the elements. The writers think the following shows that ordinary ingots are seriously affected by the redistribution of the elements, and are of the opinion that segregation and piping in the ingots used are the causes of by far the larger percentage of failures of steel tires. If this opinion can be substantiated, then, as the two evils, viz., piping and segregation, occur in the same part of the ingot, we are enabled, by the removal of that part and using only that which is more nearly perfect, to reduce the percentage of failures to a minimum.

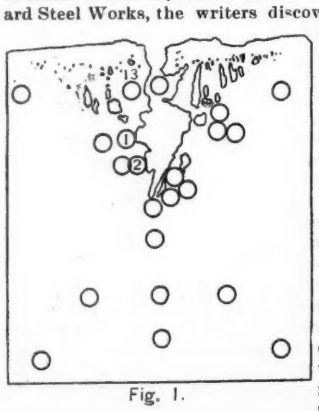


Fig. 1.

Fig. 2.

Segregation is a concentration of a part of the elements in a certain portion of the ingot, thus giving compounds richer in these elements than the principal part or body of the ingot. The concentration takes place in a part which solidifies last. There appears to be the greatest tendency to segregation with carbon, phosphorus and sulphur. Only in one or two instances was there found a decided variation in the percentage of silicon and manganese in different parts of the ingot. However, the ingots in question were comparatively small, and perhaps for that reason the segregation of silicon and manganese did not occur. Segregation principally occurs around the sides and at the base of the shrinkage or pipe-hole at the top of the ingot; see figs. 1 and 3. Samples from the extreme top of an ingot usually give less percentages of other elements and a greater percentage of iron than the samples taken from the body of the ingot. It is a question whether some of the hard spots found in tires after the first or second turning may not be due to segregation; doubtless the majority of hard spots are due to the sliding of the wheels. If a hard spot is due to segregation, chemical analysis will show it. An etching shows a decided difference in appearance between the segregated and non-segregated metal where the segregation is marked. Segregation is shown by porous or granular appearance; it is much more apparent in the etched metal than on a print taken from an etching. Segregated metal is called "porous," and non-segregated "solid."

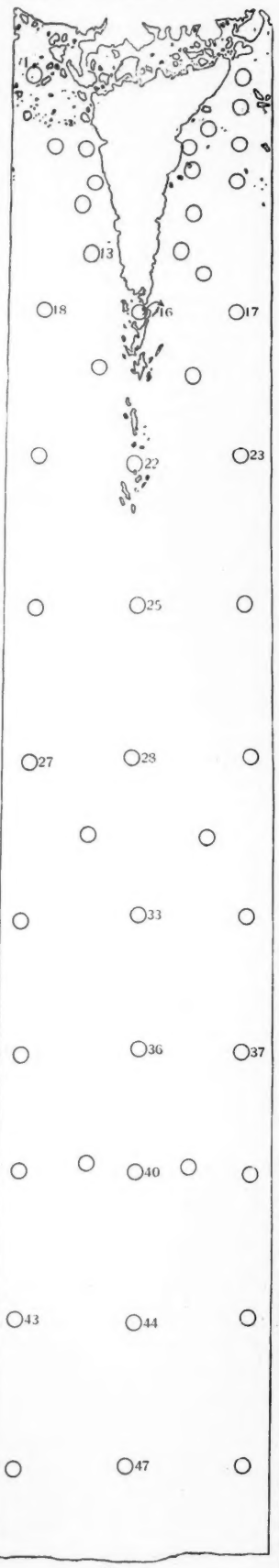


Fig. 3.

It is difficult to get enough material for complete analysis from porous spots, and there is a liability of getting the solid material underneath the porous spots when drillings are taken for analysis. The writers make a practice of etching one half of broken test pieces as close to the point of fracture as possible and have yet to find a case where there was a marked variation in physical tests in the same tire, that etchings of broken test pieces did not show a reason for this variation. By following this plan of etching a reason might perhaps be found for some of the otherwise inexplicable results frequently met with in the testing of material. While it is a point hard to determine, yet it seems that the line between segregated and non-segregated metal is pretty sharply drawn.

Fig. 4.

Fig. 1 shows segregation in a small ingot 12×13 in., weighing about 400 lbs. It was one of a group that was cast from the bottom in molds of cast iron and with cast iron covers. The sample holes for analysis are shown. Fig. 2 shows a print from an etching of the ingot near the pipe or shrinkage hole. Segregated material is shown by the light spots near the cavities. The appearance of the etched metal at these points is granular. Samples from hole 13, fig. 1, gave least carbon phosphorus and sulphur, while sample from hole 2 gave most of these elements. The sample from hole 2 was not large enough for complete analysis, hence comparison is made with hole 1. The following are the comparative results:

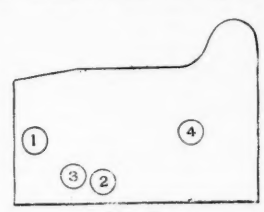


Fig. 5.

Fig. 6.

Fig. 7.

	Carbon.	Phosphorus.	Sulphur.
Hole 1	.80	.073	.059
Hole 13	.53	.035	.024

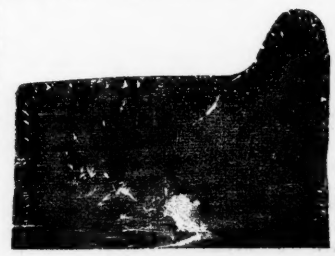


Fig. 8.

Outside of the vicinity of the shrinkage hole or pipe the metal is quite homogeneous.

Fig. 3 shows a long bottom cast octagonal ingot 66 in. by 12 in. at the bottom and 11 in. at the top. From an etching made from half of this ingot, and from analyses, it was found that segregation had only taken place in a small degree. Samples from holes 16, 22 and 25 show more carbon, phosphorus and sulphur than samples from holes at the sides of the ingot at the same distance from the bottom. Samples from holes 28 and 33 show about the same result as samples from the holes at the sides. Samples from 36, 40, 44 and 47 give results with slightly less carbon, phosphorus and sulphur than samples from holes at the sides. Samples from holes 18, 23, 27, 28, 37, 43 and 44 give almost exactly the same percentage of silicon and manganese. The average of samples taken from the series of holes beginning at 18, at the left side; at 16, at the middle; and at 17 at the right side, show almost identically the same percentage of carbon, phosphorus and sulphur.

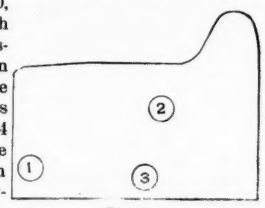


Fig. 9.

Fig. 4 shows a print from an etching of a tire made from a short ingot about 12 in. long. The piping is clearly shown, the flange side of the tire was at the bottom of the ingot. The analysis shows a marked segregation, but not as decided as is sometimes found. Segregation occurred in the immediate vicinity of the pipe as at 1, 2 and 3, fig. 5, which gives the location of holes for samples. Fig. 6 shows an etching from a test piece, marked 2, and fig. 7 is an etching from test piece 4, both taken from the tire, fig. 4. The etchings show clearly why test piece 2 gave inferior results. The following are the results of tests:

Fig. 10.

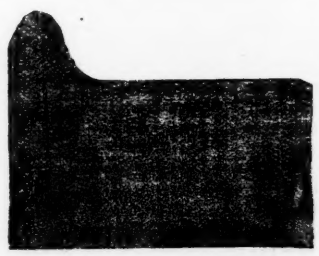


Fig. 11.

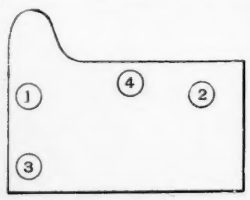


Fig. 12.

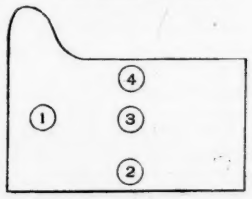


Fig. 13.

Mark.	Diameter of test piece.	Breaking point.	Elong. per cent. in 2 in.	Reduction of area, per c't.
2	.564 in.	87,200 lbs.	2	2.2
4	"	104,800 lbs.	16	30.7

Fig. 8 shows one of the worst cases of segregation found. This tire broke after having been on wheel

* Extract from a contribution to discussion of Mr. Alexandre Pourcel's paper on Segregation, read in the Metallurgical Section of the recent Engineering Congress at Chicago, by A. A. Stevenson and R. Kent, of Burnham, Pa.

† See report of 1881 meeting, Iron and Steel Institute, Snelus' paper on Segregation.

center only a few days and before the wheels were put in service. The fracture was clean and no defects were apparent on the surface, yet an etching showed a decided segregation. Fig. 9 shows location of sample holes. The following were the results of the analysis:

Hole.	Carbon.	Silicon.	Phos.	Manganese.	Sulphur.
1	.68	....	....	....	.051
2	.72	.177	.063	.990	....
3	.96	.196	.118	.905	.112

The results of the pulling tests of pieces taken from this tire are as follows:

Mark.	Diam. of test pieces.	Ultimate.	Elong. per c't. in 2 in.	Reduction of area, per cent.
2	.564 in.	109,200	2	2.1
4	"	130,000	10	13.

Mr. H. M. Howe, in his "Metallurgy of Steel" says: "Heterogenous composition usually implies heterogeneous strength and ductility; and the strength of a heterogeneous substance is usually nearer the strength of the weakest component or part than the average of all the parts; the test piece tends to break down piecemeal, so with ductility." This being so, the character of such tires as are shown is to be judged, not so much by the best results that can be obtained from a section of the tires, but by the poorest.

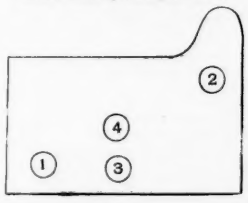


Fig. 14.

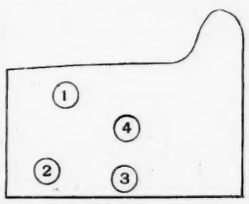


Fig. 15.

Fig. 10 is a sketch showing an ingot 5½ ft. long, from which four billets were cut, marked *A*, *B*, *C* and *D* respectively. These billets were made into tires, the top portion of ingot, or the piece not marked, having been scrapped. These billets ranged in weight from 760 to 800 lbs. Fig. 11 is a print from an etching of a section of one of these tires, and is typical of them all. Figs., 12, 13, 14 and 15 show location of holes from which samples were taken for analyses. The tires were all cooled in air as they came from the mill without being subjected to any further treatment. The chemical analyses show that the carbon, phosphorus, sulphur, silicon and manganese, were very nearly the same at all the points taken, while the ultimate tensile strength varied only from 132,000 to 136,000 lbs. The elongation varied from 8 to 11 per cent. and the reduction from 9.4 to 13.8 per cent., which is in marked contrast to the results from fig. 8. The results of analyses and tensile tests of samples taken at holes 1 and 2, fig. 16, from tires made from billets taken from long ingots, show practically no variation in composition and but little variation in ultimate strength, elongation and reduction of area. As a result of the writer's investigation, and other experiments, the Standard Steel Works have abandoned the use of short ingots for tires and are now using billets cut from ingots 5½ ft. long of different diameters. The top of pipe end, where segregation occurs, is cut off and scrapped.

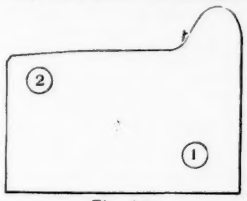


Fig. 16.

Interesting etchings illustrating the effects of segregation on tires were given in a paper by Mr. Godfrey W. Rhodes, Superintendent of Motive Power, Chicago, Burlington & Quincy Railroad, in a paper on Steel Tired Wheels and Their Fastenings, before the Western Railway Club, October, 1890. The mixture used for etching is three parts sulphuric acid, one part hydrochloric acid and nine parts of water.

The Block System on the New York Central.

BY A. T. DICE,
Superintendent of Signals, New York Central & Hudson River R. R.

The interlocking and block signals as installed on the New York Central & Hudson River Railroad are now complete from New York to Buffalo, a distance of 440 miles, and thence to Suspension Bridge, 22 miles further.

The mechanical interlocking is of the standard type, as made by the Johnson Railroad Signal Co. and the Union Switch & Signal Co.* The electric lock and block work is of the most advanced type. It is commonly known as "The Improved Sykes." The only feature of the old Sykes that is retained is that the signal lever is controlled by the signalman in the adjoining tower, but the method of carrying this out is essentially different. In the old Sykes there is an electric lock on the lever, controlled or held in the locked position by a permanent (horse-shoe) magnet. Above the permanent is a pair of electromagnets. The operator in an adjoining tower, when asked to unlock by plunging (he can only plunge when his signal lever is at danger) closes a circuit which energizes the electromagnets, neutralizing the attraction of the permanent magnet, allowing the lock to drop free by gravity.

It will readily be seen that any foreign current, as a cross of line wires, lightning, etc., would perform the same office as a plunge. In practice this often occurred and managers lost confidence in the apparatus. In the system, as applied on this road, the lock is applied to the preliminary locking, and unlocking by gravity has been supplanted by the gravity lock, so that the lever is unlocked only when the proper combination is had and all connections are perfect. In any case of failure the lever remains locked.

The train is also made a factor by insulating a short section of track at each tower. After a train has once entered block *A B* it is impossible for *B* to unlock for another train, until the train which has entered the block has cleared it and B's signals have been restored to danger. A signalman can plunge but once until he has received an unlock and cleared his signal and restored it to danger. At interlocking towers, where we have a home and an advance signal, the lock is on the advance signal and the plunger on the home signal. We put a track circuit from the home to the advance signal, locking the home signal, so that when anything is standing between the home and the advance signal, it

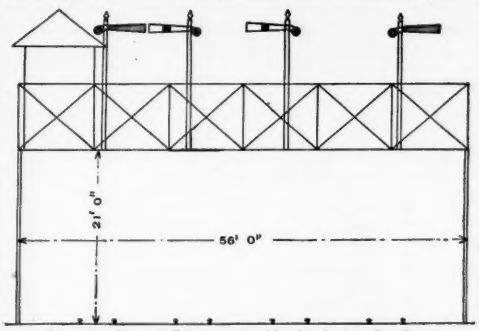


Fig. 2—Signal Bridge, N. Y. C. & H. R. R. R.

is impossible to clear the home signal. This, with the addition of the automatic slots, or signal replacers, to be applied to the advance signals (as proposed by the signal companies), it was thought would thoroughly cover the ground.

But in the application of the slots great difficulty was encountered, on account of their fine adjustment. Moreover, in case of a failure of the slot, your advance signal may be at danger while the distant signal is clear; and the slot was, after patient experiments, condemned. We were then compelled to cover this point, and, as a matter of necessity, evolved the following (to be accomplished either electrically or mechanically): Signals at interlockings can only be cleared in this order—home, advance, distant. You can then receive a train, and after it has passed your home signal you can restore that signal to danger and plunge for another train. You cannot again clear your home signal until the preceding train has passed your advance signal and it has been restored to danger. It is, of course, possible to clear either home or advance signal when the block is clear, but when it is desired to clear both it must be done in the order described.

This system is operated as an absolute system, and trains are not permitted to pass signals at danger without a written order being given to the engineman. These orders are of two kinds. The clearance card (white) is used when the block has been reported clear, and it is impossible to clear the signals on account of electrical or other failure. The caution card (green) is used when no communication can be had between the towers, and when necessary to forward a train into a block not yet clear to assist a disabled train, etc. These cards are filled out by the signalman and given to enginemen, and upon completion of the trip they are sent to the superintendent's office.

The signals that have been put in recently are provided with lamps having an 8-in. corrugated lense, using a globe on the burner. They are a great improvement on anything hitherto used. They are used only on high signals, the dwarf signals being fitted with 5-in. corrugated lenses.

The electrical control of outlying switches is accomplished by putting a derailing switch in the siding, and connecting the main track switch and the derail to one lever. The lever is placed in a small hut at the switch, and an electric lock, placed on it, is controlled by the man in the tower at the outgoing end of the section. Communication is had between the tower and the hut by a bell, using a simple code. The New York Central & Hudson River was the first road to adopt these locks.

To carry out this interlocking and block system on this road 1,633 levers were required, as follows: Hudson Division, 1,081; Mohawk Division, 278; Western Division, 274.

One hundred bridges for signals were used, and on sixty of these signal towers were placed. The design of these bridges was shown in the *Railroad Gazette* of May 13, 1892, and an outline sketch of one, on which a tower is supported, is shown herewith fig. 2. The illustration shows the signals as they appear to an engineman running east. The northernmost pair of tracks is used by the freight trains, which run "left handed," that is, the the trains on the track at the extreme left run eastward. The south pair of tracks is used by the passenger trains, which run "right handed." The forty towers located on the ground are of four different sizes, varying according to the number of interlocking levers which they provide for. The signal bridge is about 9 ft. wide, and so braced as to have ample stiffness. Where there is no signal bridge the home signals are generally located 150 ft. beyond the tower.

In installing this system, an eight-conductor aerial cable was used between Albany and Buffalo, a distance of 301 miles. This is suspended about 12 ft. from the ground (on the Western Union telegraph poles, with an intermediate pole), and is supported by a No. 6 iron wire.

The plan of tracks printed herewith, fig. 1, shows the yard at East Buffalo, which is now being signaled and interlocked, the whole requiring 70 levers. This is the point where all freight is interchanged with the Lake Shore and the Michigan Central railroads, about 2,000 cars a day.

* From New York to Spuyten Duyvil block signals have been in operation for many years. From Spuyten Duyvil to Yonkers the apparatus was erected by the railroad company. From Yonkers to Poughkeepsie, 58 miles, the apparatus was put in by the Johnson company and the electric locks are Patenall's patent, described in the *Railroad Gazette* of May 26 last. A diagram of a part of this section of the road was printed in the *Railroad Gazette* of Jan. 15, 1892. From Poughkeepsie to the western terminus of the road the apparatus was all put up by the Union Switch & Signal Co.

Balancing Slide Valves.

The following paper, by Mr. R. P. C. Sanderson, Division Superintendent of Motive Power, Norfolk & Western Railroad, was read at the September meeting of the Southern & Southwestern Railway Club at Atlanta, Ga.:

The question of balancing slide valves having been raised in conversation between Mr. Pulaski Leeds and myself, and as we were by no means satisfied with the old "rule of thumb" method of balancing slide valves on locomotives, I promised that I would take the time to work it out, and get a clear idea of what proportion of a slide valve should be balanced to obtain the best results.

I have constructed a diagram showing the total pressure on the valves of our consolidated and heavy passenger engines during each portion of the valve travel, supposing them to be entirely unbalanced. I hand you herewith a sketch showing the steam and exhaust ports, and the valve of a consolidation engine in its central position. Second, a sketch showing the steam and exhaust ports with the valve of a heavy passenger engine in its central position. Third, copies of three indicator diagrams, which I think can fairly be considered as typical. The first, for the steam distribution of a heavy freight engine pulling at slow speed. Second, for a heavy passenger engine pulling at moderate speed. Third, for high speed passenger service. Sketch No. 4 shows a Zeuner diagram, which has been constructed to suit diagram No. 2. This diagram is not absolutely correct, as it does not take into account the interference to the movement of the valve caused by

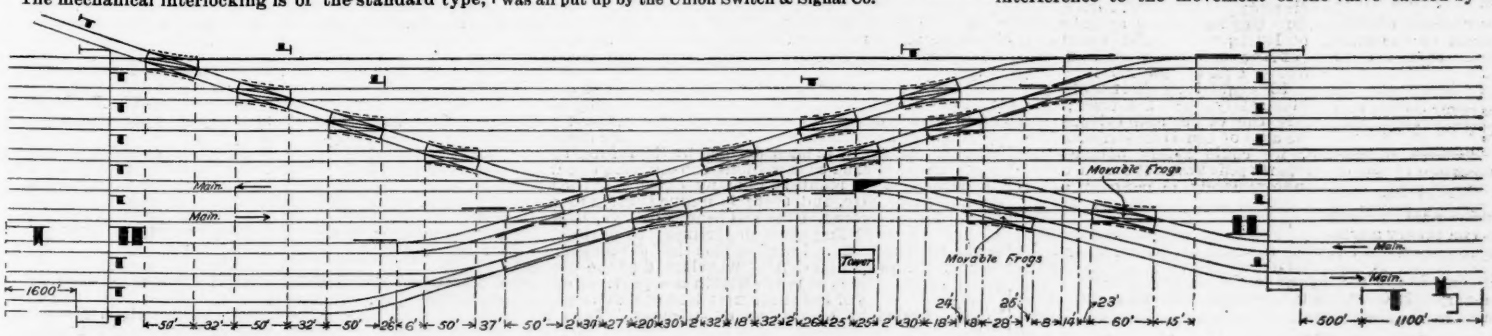


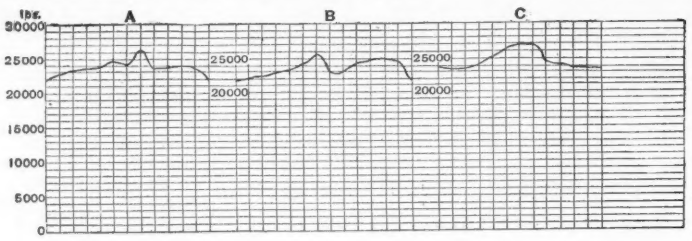
FIG. 1.—EAST END OF BUFFALO YARD.
New York Central & Hudson River Railroad.

the back motion eccentric. It was not considered worth while to complicate the diagram by introducing this, as it produces but slight variation, not sufficiently to interfere with the accuracy of our calculations in balancing. You will notice that I have established on this diagram approximately the relative position of the valve and the piston for each position during their entire stroke. Similar diagrams were constructed to suit cards No. 1 and No. 3.

Having thus established the corresponding positions of the valves and pistons, the valves in sketches 1, 2 and 3 were placed in their various positions over the steam ports, and by the means of the Zeuner diagrams have established the corresponding cylinder pressures, having also the steam chest pressures, which vary slightly at different positions of the stroke. After doing this, the total downward pressures on the valves were calculated for each position for each diagram, and the results are shown in three graphical diagrams, marked A, B, and C, the horizontal lines of which represent pressures of 1,000 lbs. each, the vertical lines simply representing the different positions of the valve while the measurements were being taken. You will observe that for freight engines, the minimum net pressure on the valves is close to 22,000 lbs. This is with a boiler pressure of 140 lbs. and an average steam chest pressure of 135 lbs. The maximum pressure of the valve is 26,300 lbs. On the diagram for heavy passenger service the minimum pressure is 21,700 lbs. and the maximum pressure 25,400 lbs. In Diagram C, for the fast passenger service, the minimum is 23,200 lbs. and the maximum 26,900 lbs. The lowest net pressure is therefore about 21,500 lbs. If this figure is divided by 135, representing the average steam chest pressure, it gives 160 sq. in. approximately, which would represent the area in square inches to be balanced, so that at the position of the minimum pressure on the valve the valve would absolutely float, or be in perfect balance. This would not do in practice, as the valve in this position would have a tendency to lift to one side. It would be safe to make an arbitrary assumption that at no time should there be less than 500 lbs. net downward pressure on the valve. This would give us a maximum of between 4,000 and 5,000 lbs. (over two tons), which is certainly a plenty at high speed. To obtain this, we require an area of 155 sq. in. The exhaust port in this case is equal to 48 sq. in., each steam port is equal to 26 sq. in. Our valves are actually balanced to the extent of 110 sq. in., which is equal to a little over the area of the exhaust port and two steam ports, which would equal just 100 in. This is, however, about 50 sq. in. short of the amount which could safely be balanced; or, roughly speaking, where the valves and bridges and port areas, as well as the area of the side strips, are in the usual proportion, we could safely balance the amount of two steam ports plus twice the area of the exhaust ports, or say approximately 75 per cent. of the total area of the valve, figured from its extreme outside dimensions.

The theory advanced by some scientists that there is a film of steam between the face of the valve and the seat, which is supposed to counterbalance some of the steam on the top of the valve, is, in my opinion, not tenable. If we figure to ourselves a perfectly flat plate, such as a surface plate on a perfectly flat surface, with a yoke attached to this plate, the valve rod of the yoke being carried through the stuffing box of the steam chest, and if we applied in the steam chest a pressure of 145 lbs., the plate will be pressed down on the flat surface with a pressure amounting to 145 times the area of the plate in square inches; and if we wish to move the plate we will have to overcome the friction due to this total pressure. The same conditions exist with the surface of the valves and the cylinders which are in contact, such as the bridges and side strips, which are in close juxtaposition to the exhaust port, and the inner bridges are consequently uncovered to the exhaust, so that I feel certain that the "film of steam" theory ought not to be taken into account in figuring the balancing of these valves.

I have hunted through all the literature that I possess, and made inquiry in other quarters to see if any person had taken up this question of balancing valves, and the only thing I can find is a paper by Mr. C. M. Giddings, read before the Mechanical Engineers' Association, in which he described a very ingenious dynamometer, so constructed that it could be inserted in the valve stem of an engine, to measure the push and pull, at the same time also recording the strains on a card. One of the diagrams produced is copied in fig. D. The instrument is very defective in that the diagrams are subject to distortion, owing to the influence of vibration on the springs and momentum of the moving parts, especially at the ends of the strokes at x x, but the diagram shows that the frictional resistance during the center portion of the valve travel follows a similar line to those in fig. C; the indicator card No. 3, from which fig. C was prepared probably, was like the card from the small engine from which Diagram D was taken. The paper does not give scale, pressure or dimensions of valves, but does state that after allowing for distortions due to momentum of parts and vibration of springs, the unbalanced valve took seven per cent. of the total power developed in the cylinder of a 9×12 in. stationary engine, running 100 revolutions, while the balance valve only took 1.1 per cent. of the total power developed. How much of the valve was balanced is not stated, but the above indicates unmistakably that every square inch that can be safely balanced should be balanced.



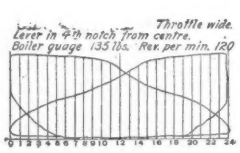


Fig. 2.

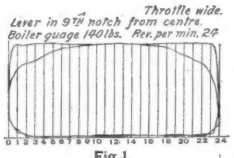
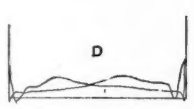


Fig. 1.



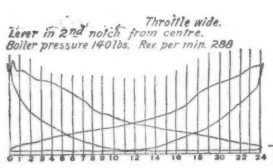


Fig. 3.

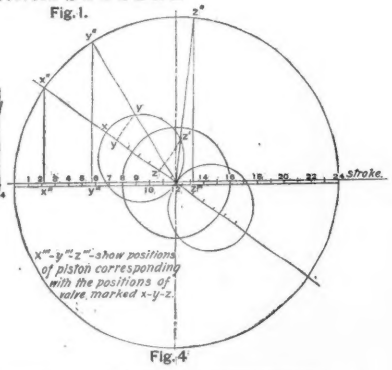
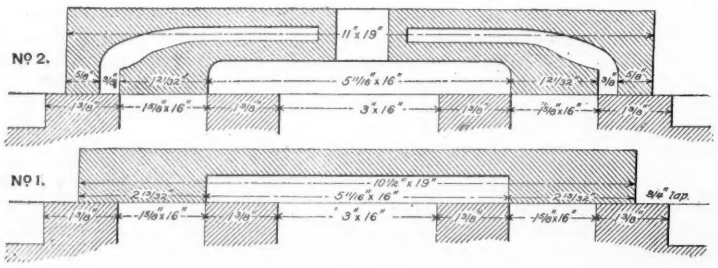


Fig. 4



Sanderson on Balancing Slide Valves.

Permanent Way and Rolling Stock.

What follows is an abstract of a discussion at the November meeting of the New England Railroad Club.

Mr. LAUDER: I have always been an advocate of having conferences or organizations comprising membership from both the rolling stock and permanent way departments of railroads, so that they might harmonize their plans with reference to their work. The question of the proper distance between the point and wing of a frog, or, in other words, the width of the throat of the frog, has been decided by the chief engineer or by some organization composed exclusively of permanent way men, while the thickness of the flanges and the distance between flanges have been decided by the rolling stock department, in each case without consultation one with the other, and the result is, in many cases, that the two do not harmonize, and there is undue friction in running. The designing of the rail head, I believe, belongs as much to the rolling stock department as to the chief engineer of the road. I believe also that the determination of the proper section of wheel tread or the proper section of the tire is as much within the province of the chief engineer as of the superintendent of motive power or superintendent of the car department. Then the general officers of the railroads have a habit of interfering in the designing of the permanent way, in the designing of the rail heads, and determining what frogs and switches shall be used, entirely regardless of the permanent way department; and also of ordering rolling stock, entirely regardless of the wishes of the department which has that matter in charge. I know of cases where locomotives have been contracted for and bought and put on the road, and they had to be housed or sidetracked until the bridges could be strengthened so they could be supported properly and made safe before it was considered prudent to run them over the road. What is the proper weight to be employed? For many years it was considered that nine tons per wheel, or 18,000 lbs., was the extreme limit. My own preference would be never to go over eight tons, provided that would furnish sufficient adhesion for the work. . . . There are locomotives to-day, made to run trains at high speeds, which I assume to be more destructive to the track than those at slow speeds, that have a weight of 44 tons upon the four drivers, or 11 tons to each wheel—an enormous weight resting upon one point of the rail, and that point a knife edge almost, bounding along at 70, 80, 90, 112½ miles an hour. Now, I think if it is necessary, in order to get steam to do the work required by modern railroading, to have such enormous weights—and I believe it is—that we must resort to different types of engines; we must have more driving wheels, so that this great weight may be distributed over more bearing points. I now speak of engines for passenger service. This means going into the complications of 10-wheel engines or moguls. . . . I believe the true solution is this: When the character of our grades is such, and when the weight of the trains is such, that an engine running, not to exceed 55 tons, cannot do the work, it is vastly more economical and safer to divide the trains and make two where before one was run. Between Boston and New York the Boston & Albany road did this very thing a year or two ago. Their train leaving Boston at 11 o'clock at night got so heavy that it was difficult to make time with it, and they wisely divided it into two. The Shore Line has done the same thing within a year. I believe that is true economy, although you can figure out that it costs more to operate the trains, because it adds so much to your train-mileage; but the question of whether it costs more on that account does not cover the whole argument. The question of safety is a most important factor, and I believe that if you have got to use more than an ordinary 18×24 cylinder engine on our New England roads, it is better to divide the train, that it is vastly safer than to attempt to run such enormous trains as some of us are doing to-day. Perhaps as heavy a train as is run in New England is our Fall River steamboat train. On my last trip to New York I went by that train. We had 10 vestibule cars weighing 32 tons each, and 3 parlor cars weighing 45 tons each. Fourteen cars is the regular train. That train is handled by an 18 × 24 cylinder engine.

Instead of so enormously increasing the weight of passenger engines, I believe we can get better results with a lighter engine carrying a higher pressure of steam. I am free to say we have got all over being afraid of 200 lbs. of steam. I do not believe there is any more difficulty in constructing a boiler that is safe with 200 lbs. than with 100 lbs. It is simply a question of design, material and workmanship, and a 50 ton engine with 18 × 24 cylinder, carrying 200 lbs. of steam, will handle a train that a 60 or 70 ton engine with a lower pressure would have difficulty in taking care of. It is a mistaken idea that it takes an immensely heavy engine to furnish the proper amount of adhesion to handle a passenger train. Any one who has made experiments with the dynamometer will understand this.

With reference to freight engines the problem is different; we must have adhesion there to get the trains over the hills, and this means that we have got to have heavy engines. This problem was years ago, and on heavy freight trains you see the mogul and the consolidation. . . . On freight engines there is not so much objection to multiplying parts as there is on passenger trains, but we must not jump at the conclusion that we will order a lot of freight engines to weigh 75 or 80 tons each without consulting the chief engineer, as is sometimes done by managers and directors.

As to running locomotives until the tires get badly worn, if I had charge of the track of a railroad I would protest against it more vigorously than our roadmasters do to-day. I have seen in the West switching engines working actively jumping over frogs, with wheels worn ¾ in. right down into the tire by actual measurement. If there is anything expensive to a railroad it seems to me it is allowing locomotives to run in that way, or even half as bad. I believe the oftener we take our engines and attend to the tires the more money we put into the strong-box of the railroad and the more credit we get to ourselves.

I would like to hear some discussion upon the proper width of the throat in the frog, if that is what you call it; I mean the distance between the point and the wing.

Mr. DAVIDSON: I find there are different opinions as to what that width should be but it does not vary a great deal in New England. The space adopted by the roadmasters in New England and in use generally for a number of years is 1¾ in. between the point and the wing, but west of New York a good many roads use 2 in. The Central Railroad of Georgia, having to receive wheels from different gages, makes the space on one side 1½ in. and on the other side 2 in. Their gages there are 4 ft. 9 in., and nearly all the roads have a 2-in. flangway. The difficulty that has occurred on many roads by using rigid frogs at crossings has set men to thinking. One that used one of an inch had some difficulty, and the roadmaster wanted the space made wider. I told him I thought he was wrong, because he would get his points farther apart and have a longer space of unguarded point. He had some made that way. I ran across a man who wanted his made narrower. He was having them 1¾ in. and thought it would be safe to have the throats narrowed to 1½ in. There seems to be that difference of opinion. The general practice here is 1¾ in., because they think less than that would be unsafe with the gages of wheels the Master Car Builders use. If they could get the Master Car Builders to make the gages uniform they say they could do with less space in the frog.

Mr. TURNER: This is one of the things not fully agreed upon. Formerly I had a flange opening much wider than now, on account of the great variation in the gages of wheels: but after the carmen agreed upon a regular width of gage we could make them much narrower. The narrower we can get it and pass the flange through, the better it is.

Mr. ELLIS: When I first became roadmaster of the Worcester road I decided that the throat of the frog should be 1¾ in., but soon after I ordered that they be changed to 2¼ in., for the reason that I noticed that the wheels got a shock when passing through the throat, and in time wore the head of the rail off. I noticed in the West that the flangeway on almost all the frogs was 2 in.; and on asking the reason I was informed that

they came that way from the manufacturer. I noticed on the Chicago, Burlington & Quincy the wear of the head of the rail by the flange of the wheel more than on any other road that I went over, down almost 1¼ in. in many places. I at first thought it was owing to the track having been spiked tight gage, but found that was not the fact. Some of the railmen said it was owing to wind pressure; but I afterward found that it was caused by the thickness of the flanges.

Mr. BLAISDELL: If the car wheels can be brought within ¼ in. of a uniform gage, and if the frog throats were made ¼-in. narrower, 1⅛ in. in width instead of 1¾ in., you would get a good deal more life from the frog and a better riding track.

Mr. MARDEN: It is unfortunate that we have two different gauges of track to run our cars over—4 ft. 8½ in. and 4 ft. 9 in.—and if we have a gauge of wheel that is absolutely right for the former there is difficulty in running it over the latter. To avoid this trouble a compromise gauge was agreed upon by the Master Car Builders' Association of 4 ft. 5⅝ in. between the flanges; and in the adoption of it on our road I insist that that gauge shall be strictly adhered to, and I don't care for the ⅛-in. variation; but now the question arises, If a 1¾ in. throat is right for a 4 ft. 8½ in. gauge of track, is it right for a 4 ft. 9 in. gauge of track with the same kind of wheel? On the Fitchburg road a large proportion of the track is 4 ft. 9 in. We certainly are having some difficulty with some of our frogs and switches from derailments, but have had no serious accidents from this cause. But I should be glad to have a committee appointed to thoroughly investigate this matter in detail and give us some facts as to the proper relation of the gauge of the wheels to the gauge of the road. I think it would be very interesting, instructive and beneficial to the roads and tend to their economy in construction. While our standard gauge is 4 ft. 5⅝ in., we find a good many new cars coming out of contract shops that will vary from one-quarter to three-eighths of an inch from that gauge, some wider and some narrower, mostly wider. This ought not to be.

Mr. LAUDER: It seems to me there is less wear to the flanges under vestibule cars than there is in those under cars that are allowed to swing indiscriminately and independently of each other. I believe if a car body can be held by some force, and this swinging tendency, which is brought about by inequalities of the track, to a certain extent avoided, these inequalities would be less detrimental to the rolling stock than if the cars are allowed to swing indiscriminately, as in the case where cars are not vestibuled. I hope the time will come when every car we run shall be vestibuled. I consider it one of the greatest safeguards that have been applied to cars for many a day. I don't remember of ever hearing of a Pullman vestibule car being telescoped with another car in time of collision.

Mr. MARDEN: I agree with Mr. Lauder as to the vestibuling of cars. We have trains running over our road entirely vestibuled, and, although some of our road is very crooked, those trains run more smoothly than any others. I would like to see all our through trains vestibuled, but it would not be practicable with our local lines.

MR. LAUDER: With regard to the lateral wear of the rails on Western roads, referred to by Mr. Ellis, I want to say a word. The Western roads have long tangents and few curves compared to the Eastern roads, and, although the statement may seem strange, I think there is a much greater tendency to sharp flanges on those straight Western roads than on our crooked New England ones. The ordinary freight car is called center-bearing, but it soon gets down on side bearings. Most cars are built of green wood, by contract, with the wheels perhaps ¼ to ⅛ in. out of gage, and it cannot be expected they will remain center-bearing very long; they become side-bearing. The side bearings are put in there to keep the cars from tipping over. When the car gets down on side bearings it takes an enormous force to swivel the truck under that car. When that car rounds a curve it takes a jump and swings to one side, and when it leaves the curve it comes back only far enough to allow it to run on the rail; it runs on that tangent for miles and miles, and there not being swing enough to bring it back, it grinds on the flange all the way until it comes to another curve and takes a swing the other way. I think a center-bearing car is a humbug, and that the car should have side bearings, and such bearings that the tendency of the load will be to bring the truck back straight with the sills of the car, straight with the track it is to run on. On the Western roads I think there is millions in it.

Mr. ADAMS: I have found many wheels with flanges 1⅛ in. thickness, more particularly Western wheels; perhaps there are not any in the East over 1¼ or 1⅜. The Master Car Builders adopted a rule, with the fact in view that the wheel flanges were to be 1⅛ in., that the gauge between the flanges should be 4 ft. 5⅜ in.; and with a 1¼ in. flange there is no difficulty about running it at all; and I believe to-day that all the roads, as far as possible, with the thick flange in view, drive their wheels to that gauge. I am confident that our wheels do not vary over ⅛ in., probably not over $\frac{1}{16}$. I think that this question of flanges should be presented in some form to the wheelmakers, and that the Master Mechanics' and Car Builders' associations should adopt some stringent vote in regard to the matter of the thickness of flanges, tending to make them uniform. There should be a section of wheel made, and the wheelmakers should be required to conform to it or the wheels be rejected.

The Second Track of the St. Gothard Railroad.

In May, 1893, the second track of the St. Gothard Railroad was opened for traffic. The following account of its construction is abstracted from a recent paper by the chief engineer of the railroad, Mr. Schrafl, in the *Schweigerische Bauzeitung*. To convey an idea of the difficulties encountered in this work, we give a short description of the first track of the St. Gothard Railroad. The *Railroad Gazette* of Sept. 10, 1880, contains a detailed account of its construction.

A treaty between the three states, Germany, Switzerland and Italy, that are most interested, was made in 1871 to aid the building of a St. Gothard railroad by actual payments of the cost and by guarantees of interest. The construction was then commenced on the basis of several surveys begun in 1856. The railroad was completed in 1882. The great St. Gothard tunnel, being the most important work, had been first located; its highest point is 3,785 ft. above sea level, and the respective elevations of the initial and terminal ends are 1,365 ft. and 700 ft. The ascent on the northern side is made through the Reuss Valley, and on the southern side through the Tessin Valley. Neither of the valleys has cross valleys which could be made available for the development of the railroad line; they are inclosed by high and precipitous mountains which have an average slope of 30 deg. to 45 deg. The mountains consist of hard gneissic granite, in which are imbedded softer strata of micaceous schist, of mica slate and of slate and limestone.

The total length of the St. Gothard Railroad is 159 miles, and the line may be divided into five distinct divisions, the two valley lines, the two mountain lines or ramps, and the great tunnel itself. The northern ramp commences at Erstfeld at an elevation of 1,520 ft. above sea level, and extends to Goeschenen, 3,645 ft. high, to the northern entrance of the Gothard tunnel, a distance of 12.25 miles. The fall of the valley varies

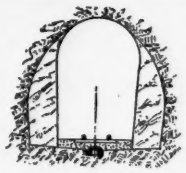


Fig. 1.

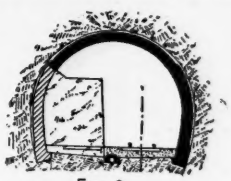


Fig. 2.

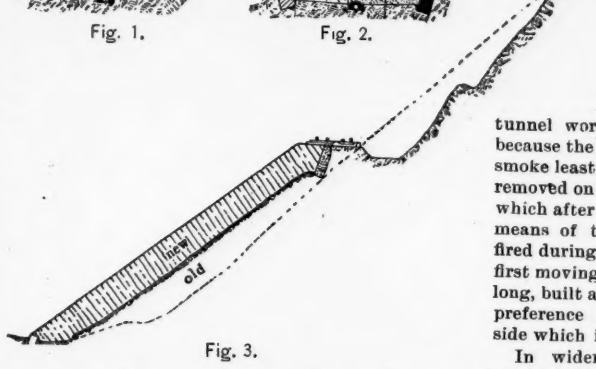


Fig. 3.

from 63 ft. to 285 ft. per mile. The tunnel ends at Airolo in the Canton Tessin at an elevation of 3,755 ft. from where the road descends the valley of the Tessin to Biasca, a distance of 21.6 miles. The difference in elevation between these two points is 2,750 ft., and the fall of the Tessin ranges between 53 ft. and 550 ft. per mile. The prime factor in the location was to follow the natural grade of the valley as long and as near to its bottom as possible and to accomplish the ascent at a few points, where there were breaks in the slope of the valley. This was done by building spiral raising tunnels, of which there are three on the northern and four on the southern ramp. The grade in the spiral tunnels is 121 ft. per mile, whereas the maximum grade otherwise was fixed at 137 ft.

The approaches Erstfeld-Goeschenen and Airolo-Biasca had originally been built for single track, but wherever the future double tracking would have been impossible after the opening of the traffic, or would have entailed considerable extra expenses, provision had been made for two tracks. For the tunnels the Pressel-Kaufmann sections were chosen, as they admit of enlargement for a second track, as shown by the illustrations figs. 1 and 2. A number of retaining walls and the pier and abutment foundations of the larger bridges had been built for two tracks except where the masonry

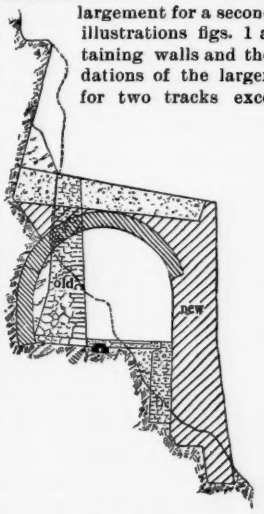


Fig. 4.

Fig. 5.

rested directly on rock. The great tunnel and four smaller ones had been arranged for double track when built. The rapid growth of the traffic of the road required the building of the second track, and in October, 1887, it was commenced, with the expectation of completing it in 1896. The continual increase of traffic made it desirable to shorten the time of construction, and the work was pushed so successfully that the second track was opened in May last.

In building the first track some definite assumptions had been made about the location of the second track, but the elaboration of detailed plans for the latter necessitated frequent deviations for reasons of economy, better acquaintance with the locality and avoidance of dangerous building operations; so that, though the two tracks are parallel, in general they cross each other repeatedly. This rendered it necessary to discontinue and shift parts of the superstructure. Sometimes the roadbed was enlarged on both sides and the axis of the double-track road changed accordingly. The minimum distance between centers of tracks was fixed at 11.5 ft., which is exceeded at the stations and other places. The work upon the substructure was let in short sections, to have the contractors give their personal attention to all work. Freight cars for the transport of materials, rails, fastenings, transfer, and turntables for the side-tracking of cars were furnished by the company free of cost, and explosives were sold by them at cost price. The most difficult works were undertaken by the railroad company itself. The excavation and transport of earth and rock on the open road comprised 690,000 cu. yds. A number of high embankments on the southern approach had to be widened, and to do this work over 100,000 cu. yds. were brought down at night from Airolo, where they had been deposited during the excavation of the great tunnel. Fig. 3 shows one of these embankments, 85 ft. high. At various other embankments it was preferred to enlarge the roadbed by building dry walls at batten of 1:3 and 1:2. Of the 30 tunnels on both the ramps, only four small ones of a total length of 930 ft. had been originally built for double track; of the others 38,500 lin. ft. had to be enlarged and partly lined; 243,000 cu. yds. of work were excavated and 38,000 cu. yds. of masonry were built. The tunnel work was done almost exclusively at night, because the train intervals were longest then, and the smoke least bothersome. The excavated material was removed on low platform cars of five tons' capacity, which after unloading were taken from the track by means of transfer tables. Generally two blasts were fired during the night and all debris removed before the first moving train passed. Fig. 4 shows a gallery, 120 ft. long, built at the approach of the Bristen tunnel in preference to cutting back the precipitous mountain side which is supported by ponderous masonry pillars.

In widening masonry structures the following method was adopted. The rock projections of the existing masonry were dressed off and the new masonry built abutting against the old one. The masonry was carefully laid and periods of time were given to allow for setting. The result was that few cracks between the old and new masonry developed, and these were very insignificant ones. Fig. 5 shows a bridge pier 170 ft. high above the foundations, which has been successfully widened in the manner described. Forty-eight thousand cubic yards of masonry were required for the enlargement of bridges and culverts.

The first of the iron bridges for the second track were duplicates of those built for the first track, but later mild basic Thomas steel took the place of wrought iron and the double intersection system, with verticals, replaced the quadruple system without verticals. Some of the single track bridges had been built in the axis of the double-track road, and had to be shifted laterally. This was effected for each bridge on one Sunday between two passenger trains. No freight trains were run on Sundays, and all work that caused traffic to be interrupted for any length of time was performed on these days. For the new bridges were needed 3,100 tons wrought iron and 2,100 tons mild steel.

The superstructure of the second track consists, for the Airolo-Faido Division, of steel rails, 75 lbs. per yard, 39 ft. long, with 15 mild steel ties, 127 lbs., for each rail; for the two other sections were used in the longer tunnels steel rails, 97 lbs. per yard, 39 ft. long; otherwise such of 93 lbs. weight and 39 ft. length. The ties were of mild steel, 145 lbs.; 16 for each rail.

During the whole 5½ years of construction the most important function of its supervising engineers was to guard the traffic against the dangers which the proximity of the operated track with the work necessarily entailed. Special signal stations were installed and detailed instructions issued and enforced. During the night the tunnels were protected from the two adjoining depots, from which, during a previously arranged period, no train was dispatched before reliable information had been obtained that the track was clear. Each working squad was covered by electric or by hand signals. All work was stopped during the passage of trains. While the maintenance of traffic impeded work, the available track was an advantage in facilitating the transport of materials, and the continuous downgrades from both ends of the great tunnel were used for gravity railroading.

The original cost of the St. Gothard Railroad had been about $48,000,000, of which the great tunnel takes $12,500,000. The second track required an expenditure of $2,500,000 only.

Comparative Dimensions of Locomotives at the World's Fair.

It seems fair to suppose than in designing their locomotives for exhibition at the World's Fair, the various locomotive builders that are represented put in practice what years of experience has led up to in regard to the proper relation of heating and grate surfaces to each other and to weight on drivers; therefore these locomotives may be taken as representatives of the best modern practice, and averages obtained from them must indicate very accurately present tendencies in locomotive design.

Table No. 1, presented with this, gives the ratio of

TABLE No. 1.—COMPARATIVE DIMENSIONS OF LOCOMOTIVES AT THE WORLD'S FAIR.

Name of builder and operating road.	Type and class.	Weight on drivers, pounds.	Diameter of drivers, inches.	Diameter of cylinders, inches.	Stroke of piston, inches.	Boiler pressure, pounds per square inch.	Area of grate, square feet.	Area of tube heating surface, square feet.	Area of fire-box surface, square feet.	Total heating surface, square feet.	Sq. ft. of fire-box heating surface to 1 sq. ft. of grate.	Sq. ft. of total heating surface to 1 sq. ft. of grate.	Sq. ft. of fire-box heating surface to 1 ton on drivers.	Sq. ft. of total heating surface to 1 ton on drivers.	Sq. ft. of grate to 1 ton on drivers.
Baldwin Loco. Wks., "Columbia"	8-wheel—4 coupled	83,140	84½	13 & 22	26	180	24.75	1,349.9	128.25	1,478.1	5.18	59.71	3.08	35.56	.595
Brook's " " C., H. & D	" "	74,000	73	18	"	180	22 6	1,372.	152.	1,524.	6.73	67.42	4.11	41.19	.611
Pittsburgh " " No. 1,453	" "	72,000	72	19 & 29	"	180	26.8	1,350.	123.7	1,473.7	4.61	55.01	3.43	40.95	.744
Rhode Island Loco. Wks., N. Y., N. H. & H.	" "	77,600	78	21 & 31	"	200	34.4	1,395.							
Cooke Loco. & Mach. Wks., "E. B. Thomas"	" "	88,750	72	19	"	180	36.3	1,707.	187.	1,894.	5.15	52.14	4.21	42.68	.818
Baldwin Loco. Wks., P. & R	" "	82,700	78	13 & 22	24	180	76.	1,262.	173.	1,435.	2 28	18 88	4.18	34.70	1.840
" " " B. & O	" "	78,480	78	13½ & 23	"	180	24.75	1,544.	149.	1,693.	6.02	68.40	3.80	43.15	.631
" " " C. R. R. of N. J	" "	83,860	78	13 & 22	"	180	38.6	1,530.	166.	1,696.	4.30	43.94	3.96	40.45	.920
" " " B. & O	" "	75.220	78	20	"	165	24.75	1,544.	149.	1,693.	6.02	68.40	3.96	45.02	.658
" " " "No. 13,400"	" "	64,560	68	18	"	160	17.6	1,394.	142.	1,536.	8.07	87.27	4.40	47.60	.545
Rogers " " C., B. & Q	" "	65,500	69	18	"	165	24.5	1,308.	110.	1,418.	4.49	57.87	3.36	43.30	.718
New York Central R. R., N. Y. C. 999	" "	84,000	86	19	"	190	30.7	1,697.5	232.9	1,930.4	7.59	62.86	5.52	45.95	.716
Balt. & Ohio " B. & O	" "	75,180	76	19	"	165	28.	1,445.	133.5	1,578.5	4.75	56.36	3.54	41.98	.745
Old Colony " O. C	" "	63,200	69	18	‡ "		19.	1,235.	138.	1,373.	7.26	72.26	4.37	43.45	.601
Baldwin Loco. Wks., No. 13,351	" " Narrow gauge	37,020	49¼	9 & 15	20	180	10.	788.	73.	1,861.	7.30	86.10	3.94	46.52	.540
Pittsburgh " " C., H. V. & T	Mogul—6 coupled	100 500	54	19 & 29	26	180	24.2	1,311.	161.	1,472.	6.65	60.83	3.20	29.30	.482
Baldwin " " P. & R	" "	90,342	56	19	24	160	17.6	1,470.	137.5	1,607.5	7.81	91.34	3.04	35.57	.390
Brooks " " Gt. Northern	" "	102,000	55	19	"	180	21.6	1,232.	134.	1,366.	6.20	63.24	2.63	26.79	.424
Baldwin " " Nat'l Mexicano	" " Narrow gauge	57,(60	46	10 & 17	20	180	14.14	809.1	84.6	893.7	5.98	63.21	2.96	31.30	.496
H. K. Porter & Co., no road	" "	43,000	44	14	"	140	14.5	470.	71.	541.	4.90	37.31	3.37	25.70	.689
Baldwin Loco. Wks., B. & O	10-wheel—6 coupled	101,500	60	20	26	165	32.45	1,608.1	146.2	1,754.3	4.50	54.06	2.88	34.56	.639
Brooks " " Gt. Northern	" "	111,000	72	19	"	180	25.3	1,646.	152.	1,798.	6.01	71.07	2.74	32.40	.456
Pittsburgh " " T. H. & I	" "	110,000	72	20	"	180	32.	2,078.	158.	2,236.	4.98	69.89	2 87	40.67	.582
Rhode Island Loco. Wks., C., M. & St. P	" "	90,000	78	21 & 31	"	200	27.9	1,796.							
Cooke Loco. & Mach. Wks., no road	" "	102,000	62	21	"	160	28.	1,791.	179.8	1,970.8	6.42	70.36	3.52	38 63	.549
Baldwin Loco. Wks.	" "	93,580	72	14 & 24	24	180	18.7	1,668.2	156.27	1,824.47	8.36	97.56	3.34	39.00	.399
" " " B. & O. S. W	" "	101,000	56	20	"	160	28.	1,822.	185.	2,007.	6.61	71.68	3.66	39.75	.554
Brooks " " L. S. & M. S	" "	88,500	68	17	"	180	28.	1,462.	123.	1,585.	4.39	56.61	2.79	35.84	.623
" " "	" "	76,500	56	18 & 28½	"	180	23.	1,168.	130.	1,298.	5.65	56.45	3.40	33.94	.601
Pittsburgh " " C., H. & D	" "	85,800	56	18	"	160	22.9	1,408.	133.	1,541.	5.81	67.30	3.10	25.92	.534
Schenectady Loco. Wks., C. & N. W	" "	96,000	67	19	"	170	17 8	1,742.3	164.	1,906.3	9.21	107.07	3.42	39.71	.371
Rogers " " Plant System	" "	98,500	72½	19	"	170	31.38	1,815.	153.	1,968.	4.87	62.68	3.11	39.96	.637
Brooks " " Gt. Northern	Consolidated—8 coupled	130,000	55	13 & 22	26	180	25.8	1,419.	177.	1,596.	6.86	61.86	2.72	24.56	.397
Schenectady " " Moha'k & Malone	" "	132,000	51	22 & 32	"	180	31.1	1,878.	168.2	2,046.2	5.41	65.80	2.54	31.00	.471
Baldwin " " Norfolk & West	" "	120,600	56	14 & 24	24	180	30.95	1,709.6	168.67	1,878.27	5.45	60.69	2.80	31.15	.513
Rhode Island " " Soo Line	" "	118.220	50	21 & 31	"	180	25.5	1,746.							
Rogers " " I. C. R. R	" "	118 600	56½	21	"	165	28.19	1,454.5	168.	1,622.5	5.96	57.56	2.83	27.36	.475
Richmond Loco. & Mach. Wks., C. & O	" "	110,800	50	20	"		30.8	1,585.4	155.	1.740.4	5.03	56.50	2.80	31.42	.556
Brooks' Loco. Wks., Gt. Northern	12-wheel—8 coupled	130,000	55	20	26	180	25.8	1,419.	177.	1,596.	6.86	61.86	2.72	24.55	.397
Schenectady Loco. Wks., Duluth & I	" "	139,000	54	22	"	180	34.5	2,212.6	189.7	2,402.3	5.48	69.63	2.72	34.56	.496
Baldwin " " N. Y., L. E. & W	Decapod—10 coupled	172,000	50	16 & 27	28	180	89.5	2,208.8	234 3	2,443.1	2 61	27.30	2.72	28.41	1.035
Brooks " " C. & N. P	6-wheeler—suburban	102,000	63	18	24	180	22.6	1,452.	165.	1,617.	7.30	71.24	3.24	31.71	.443
" " " Gt. Northern	6-wheel—switcher	114,000	49	19	26	180	21.7	1,136.	144.	1,280.	6.64	58.98	2.53	22.46	.381
Schenectady " " no road	" "	99,000	51	18	24	150	22.6	1,147.5	131.2	1,278.7	5.82	56.56	2.65	25.86	.457
H. K. Porter & Co. "	4 " "	22,000	30	9	14	140	5.	165.	29.2	194.2	5.84	38.84	2.65	17.65	.454
Baldwin Loco. Wks., Wellman I. & S. Co	4 " switcher, narrow gauge	14,150	26	7	12	130	3.81	104.1	18.3	122.4	4.80	32.13	2.58	17.57	.538
Pittsburgh " " no road	4 " " " "	12 500	26½	6	10	150	3.1	62.8	18.6	81.4	6.00	26.25	2.93	13.03	.496
Baldwin " " "	4 " double end logging	46,630	44	14	24	130	11.7	660.	61.	721.	5.21	61.63	2.65	31.35	.509
H. K. Porter & Co. "	4 " back truck "	21,000	33	9	14	140	6.75	220.	36.	256.	5.33	37.93	3.43	24.29	.643
" " " "	4 " suburban	13,000	28	7	12	140	5.1	20.8	75 2	96.	14.75	18.82	11.57	14.77	.785
" " " "	4 " mill switcher	10,000	22	6	10	140	3.9	69.	19.1	88.1	4.87	22.59	3.82	17.62	.780
England.															
London & Northwestern R. R., "Q. Empress"	3-cyl. comp.—not coupled	62,000	85	15, 15, & 30	24	175	20.5	1,385.1	120.6	1.505.7	5.88	73.40	3.87	48.57	.661
Westwood & Winty., "James Toleman"	4 cyl. 8-wheeler—not coupled	80,640	90	16½ & 17	24 & 22	180	28.5	1,790.	260.	2,05[illegible]	9.12	71.94	6.45	50.85	.707
Gt. Western, "Lord of the Isles"	Broad gauge, single	35,840	96	18	24	120	25.46	1,611	156.	1,767.	6.13	69.40	8.71	98.60	1.420
France.															
Northern Ry	8-wheeler—4 coupled	67,220	83¼	13⅝ & 20⅞	25.2	206	22.	1,065.4	117.4	1,182.8	5.33	53.73	3.49	35 20	.654
State Ry	" 2-wheel trucks	56,900	79½	17.4	25.7	191	20.8	1,192.9	101.7	1,294.6	4.89	62.24	3.57	45.51	.731
Western Ry	6 " connected	90.825	...	17	23⅝	147	13.8	853.7	81.8	945.5	5.93	68.81	1.80	20.82	.304
Paris & Orleans Ry	" "	165,045	55½	17¾	25⅝	191	19.9			1,319.7		66.28		25.12	.364
Germany.															
Royal Prussian Ry	6-wheel—coupled	84,990	52⅝	18½ & 25⅝	24⅞	180	12.02	1,232.5	83.74	1,316.24	6.97	109.50	1 97	30.97	.283
" " "	" "	59,700	42½	13⅞	21⅝	176	14.	606.	51.7	657.7	3.69	46.98	1.73	22.05	.469
Canada.															
Canadian Pacific R. R	10-wheel—6 coupled	98,000	69	19	24	180	25.4	1,300.9	144.4	1,445.3	5.68	56.90	2.95	29.50	.518

TABLE NO. 2.

Type of Engine.	Square feet of fire-box heating surface to 1 sq. ft. of grate.	Square feet of total heating surface to 1 sq. ft. of grate.	Square feet of firebox heating surface to 1 ton on drivers.	Square feet of total heating surface to 1 ton on drivers.	Square feet of grate surface to 1 ton on drivers.
8-wheel	5.96	64.45	3.89	45.21	0.68
Mogul	6.31	63.18	3.04	29.73	0.496
10-wheel	6.07	63.15	3.16	37.30	0.541
Consolidation	5.74	60.48	2.71	29.10	0.482
12-wheel, 8-coupled	6.17	65.75	2.72	29.55	0.447

firebox heating surface to grate surface, total heating surface to grate surface, firebox heating surface to one ton on drivers, total heating surface to one ton on drivers, and of grate surface to one ton on drivers; and also some of the general data from which computations were made for each locomotive in the Transportation Building. This table will be found a valuable addition to a similar table given in the *Railroad Gazette*, May 6, 1892.

Referring to the last five columns of that part of table No. 1 that gives the data for the locomotives of the eight-wheel or American type, it will be observed that in a few instances there is a considerable difference between the relations of heating surface, grate surface and weight on drivers, but that in the majority of cases the average is closely estimated by just glancing over the columns. It will be noted that, generally, where the heating surface or grate surface is large the other is not as large in proportion; the extreme of what is meant is shown in the Wootten boiler, in which the grate surface is very large and the heating surface comparatively small. What has been said of the passenger type is true in a general way, of the other types also. In table No. 2 is given the average for each type of engine of each of the last five columns of table No. 1, and by it the relations of heating surfaces to grate surface, and of these to weight on drivers as they appear in the most modern practice are indicated. The ratio of heating surface to grate surface is practically the same in all classes of engines, as shown by the table, there being generally 6 sq. ft. of firebox heating surface to 1 sq. ft. of grate surface and about 63⅓ sq. ft. of total heating surface to 1 sq. ft. of grate. A comparison of heating and grate surfaces with weight on drivers shows that the eight-wheel type has considerably more of each per ton on drivers than any other type.

The proportions of the 10-wheel type approach nearer the proportions of the 8-wheel type than do those of any other class. It is not quite clear why the 10-wheel type should be better provided with heating and grate surfaces than the mogul, for the mogul type, with about the same weight on drivers as the 10-wheel has, should be as well provided with heating and grate surfaces Why it is so is because the boiler for the mogul is generally shorter than that of the 10-wheel.

The foreign locomotives exhibited vary more in proportion of heating and grate surfaces to each other and to weight on drivers than do the American engines, but there is not a large enough number in any one class of the former from which to obtain a satisfactory average.

Echoes from the World's Fair.

Attendance and Transportation.—The total number of admissions to the Columbian Exposition from May 1 to Oct. 30 inclusive was 27,539,521; of this number 6,059,380 were free and 21,480,141 paid. The value of the extensive terminal tracks provided by the Exposition company, which spread all over the southwest portion of the park, and of the large interlocking plant that was provided, is indicated by the total number of admissions on railroad coupon tickets; this number was 55,991 for the six months. The attendance was small when the Alley elevated did not take in this number each day on a two-track terminal. It was expected that all the roads would run their excursion trains into the Jackson Park terminal station, but this was not done. The Baltimore & Ohio and the Illinois Central ran their trains from the city into the terminal station, but aside from this the tracks were used mostly for storing private cars.

One of the surprises of the Exposition was experienced on the last day of October; on account of an error made by a clerk in Washington, the Fair closed officially at midnight on Oct. 30, instead of at the same hour on Oct. 31; but Chicago people had expected, and concessionaries had hoped, that the attendance would be well maintained until severely cold weather was experienced and that the real closing would occur several weeks later; the surprise came in the great decrease in attendance on Oct. 31. On Oct. 30, 242,575 persons were admitted to the Exposition, and on Oct. 31 there were only 50,713, and on this latter date the grounds appeared deserted. On Nov. 1 all the exhibitors had begun to pack their goods, the attendance was 16,100 and the desertion seemed almost complete. After Nov. 1 but few paid for admission to the grounds, the few thousand there were busy removing goods or getting them ready to be removed. The work of packing, relaying tracks about the grounds and other work preparatory to clearing the buildings has been so quickly done that there is now nothing to be seen but the buildings.

In last week's issue it was said that the Intramural Railway intended to keep a few trains running for the convenience of those employed at the grounds and such visitors who might yet wish to see the grounds at this late date. The attendance this week has, however, been extremely light, not averaging over 1,800, in consequence of which the Intramural has stopped running trains, though the structure still remains intact.

Boat Transportation.—The World's Fair Steamship Company has just given out the number of passengers carried by its boats from Van Buren street to the pier at Jackson Park during the World's Fair season; the number is 1,758,665. As was to have been expected, the greater number was carried during the hottest months, the figures for July being 458,827, most of which the "whaleback" carried. There was not a collision or accident to boats of the company during the season. The World's Fair Steam Launch Company, that operated launches running between the north and south ends of the grounds and in the basin, carried 196,698 passengers. The electric launches carried 839,757, and the gondolas 143,192 passengers. The total transportation incident to the Fair, by all boat lines, including launches and gondolas, was 3,001,012 passengers.

The Ferris Wheel.—It is claimed by the Ferris Wheel Co. that the structure cost $360,000, and that the total earnings have been $600,000. Of this latter amount the Exposition company was to receive $150,000 as its percentage. The Ferris company had a contract allowing it to do business till Jan. 4, 1894, but the Exposition officials ordered the Midway Plaisance closed on Nov. 1, and the Ferris company now brings suit to recover $75,000, a part of which is for loss of profits due to breach of contract. To recover the damages claimed, the company is advised to keep the wheel running all the time to carry visitors if they come, and so it is kept turning with empty cars. The final disposition of the wheel has not been determined; Chicago's Lake Front, Atlantic City and Coney Island have all been mentioned in connection with its location.

Columbian Museum.—Some of the latest acquisitions for the Columbian Museum are the first cable grip car and trailer, given by A. S. Haverday, of San Francisco; a machine for testing iron and steel wire, and a machine for drawing wire from a solid ingot of metal, from the Clinton Iron Works, of Clinton, N. Y.; and models of the railroad stations at Frankfort and Halle, from the

Prussian Government. Professor Chamberlain, in the Mines and Mining Building, is looking out for the interests of the museum.

Buildings.—There is a popular movement to preserve the main buildings in Jackson Park; but the Park Commissioners have ordered that all be removed before Jan 1, 1894. Mr. Washington Porter is pushing his plan to remove the Manufactures Building to the lake front between Randolph street and the Art Institute. He says that if the Common Council does not see fit to take action on the proposed removal, he is prepared to raise the money to accomplish it, and to agree that the association formed shall return the building to the city when the sum expended for its removal shall have been earned with a fair interest. The feasibility of this plan of removing the building is assured by a letter of Mr. E. C. Shankland, Chief Engineer of the World's Columbian Exposition. He says that by lessening its height and reducing it in width it may be put on the proposed site at an expense of $534,400.

Comparative Prices of American and English Rails.

The table which follows is taken from a recent issue of the *Bulletin* of the American Iron & Steel Association. Concerning this table the editor of the *Bulletin* says: "In the following table the prices of British steel rails at British ports from 1867 to 1878 inclusive are taken from a statement presented by Mr. H. V. Poor to the Ways and Means Committee of the House of Representatives in February, 1880; for 1879 the price is an average from Fossick's chart, an English statistical publication of high standing; and from 1880 to 1893 inclusive the prices have been averaged from weekly English quotations in the New York *Iron Age*. Mr. Poor's figures represent average quotations. All the other figures in the table are compiled from the statistical records of the American Iron & Steel Association. The cost in currency at American ports of English steel rails is obtained by reducing the gold price per ton free on board to American currency and adding the duty, and also by adding for the years from 1867 to 1889 inclusive $3 for freight, insurance and commissions, and $1.50 for the same items for the years 1890 to 1893 inclusive. The imports from 1867 to 1871 and from 1890 to 1892 inclusive include both iron and steel rails."

Calendar years.	United States. Production, in gross tons.	Imported in gross tons.	Duty.	Average price of gold.	Average price of steel rails in currency.	Great Britain. Price in gold f. o. b. at English ports.	Cost in currency at American ports.	English cost higher than American per ton.
1867	2,277	115,579	45 per cent. *ad valorem.*	138	$166.00	$65.70	$135.60	.....
1868	5,151	223,287		140	158.50	61.32	128.68	.....
1869	8,616	279,610		136	132.25	54.99	112.52	.....
1870	30,357	356,387		115	106.75	50.37	87.44	.....
1871	34,152	505,538		112	102.50	54.99	96.31	.....
1872	83,991	133,738	$28 per ton from Jan. 1, 1871, to Aug. 1, 1872; $25.20 to March 3, 1875; $28 from that date to July 1, 1883.	112	112.00	67.64	110.43	.....
1873	115,192	142,474		113	120.50	80.05	122.32	$1.82
1874	129,414	89,746		112	94.25	68.75	108.58	14.33
1875	259,699	16,316		114	68.75	44.28	85.82	17.07
1876	368,269	none		110	59.25	32.12	69.43	10.18
1877	385,865	31		105	45.50	29.20	63.21	17.71
1878	491,427	9		102	42.25	25.55	57.68	15.43
1879	610,682	22,372		100	48.25	26.88	57.88	9.63
1880	852,196	141,277		100	67.50	34.42	65.42	.....
1881	1,187,770	222,596		100	61.13	30.41	61.41	.28
1882	1,284,067	162,621		100	48.50	26.27	57.27	8.77
1883	1,148,709	24,125		100	37.75	22.72	53.72	15.97
1884	936,983	2,745		100	30.75	23.19	43.19	12.44
1885	959,471	2,138	$17 per ton from July 1, 1883, to Oct. 6, 1890.	100	28.50	23.11	43.11	14.61
1886	1,574,703	41,581		100	34.50	18.70	38.70	4.20
1887	2,101,904	137,588		100	37.08	19.70	39.70	2.62
1888	1,386,277	63,016		100	29.83	19.15	39.15	9.32
1889	1,510,057	6,202		100	29.75	24.57	44.57	15.32
1890	1,867,837	204	$13.44 per ton from Oct. 6, 1890.	100	31.75	26.37	44.87	13.12
1891	1,293,053	253		100	29.92	21 34	36.28	6.36
1892	1,537,588	347		100	30.00	20.03	34.97	4.97
1893, Oct. 5	.....	.....		100	29.00	18.63	33.57	4.57

Collisions in Chicago.

A dense fog enveloped Chicago on the nights of Nov. 8 and 9. It cleared somewhat during the day of the 9th, but later came on again and hung over the city till the morning of the 10th. It was densest from about 5 p. m. on the 8th until about 9 a. m. on the 9th, and during this time several railroad accidents happened within the city limits. The most serious accident happened at the Seventy-first street station of the Chicago, Rock Island & Pacific. A suburban train left the terminal station in the city at 5:50 p. m., and at 6 p. m. an express train followed it. The suburban train made several stops before arriving at Seventy-first street. It made the regular stop at this station, and while standing was run into at the rear by the express train. Five persons were killed and seven have died from injuries received. Twenty-three others were seriously injured. At 6 o'clock that evening the street gas lights were visible only about 400 ft., and the red tail lights were probably not visible so far as that. An officer of the road states that the foremost train, No. 127, left Englewood, about one mile north of the point of collision, at 6:19, and the express train, No. 11, at 6:30. No. 127 had to stop at Sixty-fifth street, Normal Park and Seventy-first street. It was just starting from the last named station when it was struck.

On the morning of Nov. 9, at about 8 o'clock, when traffic is heaviest, a rear-end collision occurred at the Twenty-second Street Station of the Chicago & South Side Elevated road. This accident, too, was occasioned by the fog. Beyond fright and a few bruises, no one was injured. The car that was struck by the following locomotive was well filled with passengers, and the locomotive struck it with sufficient force to enter the car several feet; that the passengers were not seriously injured was due to a mere chance. It happened that on the train causing the collision was the messenger who collects every morning the daily reports from each station. To expedite the collection the engineer is instructed to give a whistle signal when approaching each station so that the ticket taker may be up on the platform with the report for the messenger by the time the train stops, permitting the messenger to continue on the same train. The leading train was standing at the Twenty-second Street Station, taking on passengers when the whistle signal for the daily report was given by the following locomotive. The passengers in the rear car of the forward train heard the whistle signal and understood it for a danger signal; they also saw the headlight of the approaching engine, and all rushed to the forward end of the car. Without this accidental warning, undoubtedly several lives would have been lost. The engineer did not see the train ahead in time to slacken much, but the emergency brakes were applied and the engine reversed when the car was struck.

The third accident happened on the morning of the 9th, on the Galena Division of the Chicago & Northwestern at Hoyne avenue; a light engine ran into the rear end of a suburban train that had been stopped by a signal and was just starting. Beyond some splintering of the rear car, no injury was done, as the light engine was running slowly. The Galena Division, with the exception of 3,000 or 4,000 ft. between the crossing of the Chicago, Milwaukee & St. Paul with the Northwestern and Robey street, is protected as far west as West Fortieth street with the Union Switch & Signal Company's automatic block signals and interlocking. The accident happened in the unprotected portion at Hoyne avenue, just west of Robey street. The scheme for interlocking the crossing of the St. Paul and the North western was prepared some time ago and the material is all ready to be put in place. It will be noted that the three collisions which happened as direct results of the fog occurred on tracks unprotected by fixed signals.

Railroad Matters in Chicago.

Freight Traffic.—The outward freight traffic of the Western railroads continues moderate, especially in coal tonnage which is reduced by the mild weather to a small volume, and as the consumption is lessened as the season advances that class of business is necessarily lost. The movement of merchandise to the interior is also affected adversely by the high temperature which reduces the demand for many lines of goods which usually meet the largest sales through the closing month of autumn. The loss in revenue is the more seriously felt just at present because of the decreased receipts from passenger traffic since the close of the World's Fair. But while the earnings of the railroads from the class of freight referred to are not up to estimates, they are not, as many suppose, unprecedentedly small for the season; in fact they will compare favorably with the average at corresponding periods prior to 1892, when business was phenomenally heavy.

The traffic of the leading Western roads as indicated by their deliveries of flour, grain, provisions and live stock here during the past week showed a fair reduction from the previous week in grain and provisions, but a slight gain in flour. The aggregate of flour and grain reduced to bushels was 5,306,000 bushels, against 5,523,000 bushels last year. A comparison with previous years also shows a reduction, but it was not large, so that the present movement compares favorably with that in other years. A glance over the table shows that the Northwestern road lost in flour, and gained in wheat when compared with last year. The Rock Island and St. Paul gained in both, but the Burlington lost more than any other road.

The following table shows the deliveries of flour and grain by the leading roads centering in Chicago, for the week ending Nov. 11, with comparison for the same time last year:

	1893. Flour.	1893. Grain.	1892. Flour.	1892. Grain.
	Bbls.	Bush.	Bbls.	Bush.
C. & N. W.	13,615	864,000	30,999	722,000
Ill. Cent.	6,000	591,000	300	683,000
C., R. I. & P.	17,990	467,000	5,400	363,000
C., B. & Q.	10,154	1,314,000	21,722	1,897,000
C. & Alton	7,750	213,000	3,450	145,000
C. & E. Ill.	450	101,000	.....	78,000
C., M. & St. P.	20,100	684,000	19,050	508,000
Wabash	1,950	179,000	2,700	112,000
C. & G. W.	13,486	197,000	18,719	334,000
Wis. Cent.	150	255,000	.....	198,000
A., T. & S. Fe	1,029	4,000	1,542	12,000
L., N. A. & C.	.....	10,000	147	7,000
Totals	92,674	4,879,000	103,029	5,059,000

The deliveries of grain and live stock at Chicago by the Western roads for the month of October, and for the corresponding time last year compare as follows:

	1893. Grain.	1893. Livestock.	1892. Grain.	1892. Livestock.
A. T. & S. Fe	2,527	1,291	1,811	2,559
C., B. & Q.	7,034	8,115	9,586	6,613
C., R. I. & P.	3,761	2,286	4,739	2,397
C., M. & St. P.	4,777	3,194	4,487	2,987
C. & N. W.	5,577	4,617	4,827	3,858
C. & A.	1,475	1,600	2,626	1,807
C. & E. Ill.	596	303	1,154	371
Ill. Cent.	4,479	1,253	4 450	1,362
Wabash	1,264	1,146	1,924	2,215
Wis. Cent	14	467	30	942
C. & Gt. W.	1,093	1,192	2,589	596
Other Roads	918	4 9	2,557	471
Total Cars	31,475	26,173	40,792	26,169

Passenger Traffic.—The recent accident on the Chicago, Rock Island & Pacific is regretted by the officers of every railroad centering here; the more so as it was hoped that the roads would be able to finish up the remnants of the World's Fair business without disaster. In speaking of the accidents which have occurred to passenger trains within the past three months, the manager of a leading road which has been entirely exempt from such trouble said: "Never before in the history of the railroads centering in Chicago was so much care exercised by the managers to insure safety in the movement of passenger trains as since the opening of the World's Fair last May. Those supposed to be the most competent were selected to handle the trains and engines. They were also given strict orders for their conduct, and constantly admonished as to their responsibility. It seems, however, that despite the instructions and most earnest admonitions, the employees were not unfrequently reckless in the performance of their duty to their employers and the protection of the lives of those under their charge, but equally indifferent as to their personal safety. Under such conditions the most efficient care of railroad managers for the protection of life and property proves abortive. It has been suggested that stringent laws be enacted for the punishment of engineers and other employees who, by neglecting duty, cause the loss of life or injury to passengers under their charge, and while such laws might in many instances prove a safeguard they would not be a protection when the trains are in charge of those who are so indifferent to their duty as to jeopardize their own lives."

The demand for commissions on tickets sold the closing month of the World's Fair is causing considerable comment in railroad circles. The managers claim that there was at best little profit in the business, and they object to wiping it out by allowing commissions where no agreement was made to that effect. Some of the managers of the strong Western roads also assert that they are in favor of a total abolition of the system of paying commissions to ticket agents.

CHICAGO, Nov. 13, 1893.

Railroads in Victoria.

The average miles open in this colony for the year ending June 30, 1893 were 2,933, as against 2,829 the previous year. The capital account is £37,462,372, and the net revenue on this is equal to 2.78 per cent. The receipts and traffic have been as below:

	1891-2.	1892-3.	Decrease.
Passengers	£1,386,842	£1,260,879	£125.963
Freights, etc	1,708,279	1,665,068	43,212
Total	£3,095,121	£2,925,947	£169,175
Number of passengers	69,546,921	58,445,075	11,101,846
Tons of freight	3,654,967	3,386,888	268,079

Both the passenger fares and the freight rates were raised, a proceeding which it is stated added about £15,000 to the revenue. This must be taken as neglecting the loss of over 11,000,000 passengers and nearly 7½ per cent. in freight carried. A part of this freight is said to be held back for better prices; also as in India, the competition of wagons on the highways is beginning to be felt. The working expenditures were for 18912 £2,138,138, or 69.08 per cent. of revenue, and for 1892-3 £1,850,290, or 63.23 per cent. Of this saving of £287,848 nearly 30 per cent. was made on maintenance, 40 per cent. on rolling stock and the balance on compensation and charges.

The coal discovered in the northern part of the colony is being developed, and American passenger cars, of which they have two, will be adopted for future use.

All of the railroads in Victoria belong to the Govern ment, which makes up any deficit in net earnings. Most of the money borrowed to build these roads was at or about four per cent.

New York Canals to Be Closed Nov. 30.

Superintendent Hannan has issued an order for the closing of the Erie, Champlain, Black River, Oswego, and Cayuga and Seneca canals on Thursday, Nov. 30, at midnight, unless they sooner become closed by ice.

RAILROAD GAZETTE

ESTABLISHED IN APRIL, 1856.
Published Every Friday,
At 73 Broadway, New York.

EDITORIAL ANNOUNCEMENTS

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

According to common report the meeting of the Joint Committee which was held in New York last week was called on account of the urgent necessity for putting a stop to the demoralization which has existed all the season in export rates; yet, after two days spent in apparently fruitless discussion, by a meeting whose representatives are supposed to have full power to act decisively, the subject was referred to a committee *to investigate and report*. In view of all this, how much does the "Joint Committee" as an organization amount to? When, a year ago, Mr. Walker was elected its chairman, thus constituting a board of three Commissioners, it was given out that an effort was to be made to more thoroughly control through traffic than had been theretofore possible under the existing organizations. There is certainly a necessity for some independent authority in charge of through traffic, yet the recent resignation of Mr. Walker is a confession that the roads do not care to clothe a chairman with sufficient power to enable him to properly handle the business. Even Mr. Walker, in tendering his resignation, said that he saw no necessity for a chairman of the joint committee in the absence of a more complete and efficient organization. Are the railroads to maintain this elaborate organization simply to call meetings at which traffic officers shall waste time in fruitless discussions and then go home and cut rates as they please?

It appears that the New York Central is to take off not only the Exposition Flyer (trains 40 and 41), but the Chicago Limited (trains 1 and 4) also. Train 13, the fast mail, now leaving New York ahead of the Chicago Limited, will start at 9:30, and as this is practically a passenger train the loss of the limited will not be a serious inconvenience. But the Mail will use 26 hours to Chicago, and the North Shore limited, leaving New York at 4:30 in the afternoon, the only other train over the Central running through in less than that time, is also to have its time lengthened to 25. The fare through by 26-hour trains is $22, two dollars more than the standard rate. It is said that the Pennsylvania Limited will also be made a 26-hour train. This and the discontinuance of the Columbian Express westward and the Keystone Express eastward seem to be the only important changes in through trains on the Pennsylvania. It is said that in the vicinity of Philadelphia a few local trains are to be added. The Erie takes off one through train west of Salamanca. The Lake Shore has not yet announced all its changes, but there is to be a fast train from Buffalo to Cleveland by which passengers leaving New York at 8:30 a. m. on the Empire State Express can reach Cleveland at 9:35 p. m. The lengthening of schedules by the standard lines between New York and Chicago would seem to indicate a tendency toward lower fares; and as three of the differential lines are now in a position to run trains through in 27 hours, or perhaps less, the report which comes from Chicago, to the effect that the strong lines will try to have the differentiates reduced, may not be wholly unfounded. The Erie, by its success in taking a large share of the excursion travel to the World's Fair, has presented a considerable argument against the theory that it needs a differential because it is deficient in facilities.

It is said, definitely, that a few days ago the Maryland Steel Company accepted an order for 15,000 tons of rail, to be delivered on the line of the Boston & Albany, at $22 a ton, and that within a couple of days the Carnegie people have sold rails at $21.90 at the mill. Now we are definitely and explicitly informed that up to Wednesday noon no such transaction had been made by the Maryland Steel Company; on the contrary, the New York agents of the various mills assure us that no prices are being made at less than the Association price of $27 at the Eastern mill; that is, that nothing less than this is quoted for present delivery. On the other hand it is denied explicitly that there is any knowledge of the Carnegie mills having made sales at less than the Association price. Nevertheless whatever may be done for immediate delivery there is reasonable probability that orders may be placed to-day for delivery next year at $25 a ton. Beyond this the talk about Carnegie having smashed the Association and about sales being made at $22 is altogether speculative; and indeed it is not very profitable to speculate as to whether or not rails can be sold at less than $25 or as to whether or not a lower price than $25, or even than $27, would much stimulate orders. There is no doubt that the Association price has been too high for a good while. It has been far above what prices of pig iron and the labor cost of converting pig iron into rails have warranted. It is a disputed question whether or not the railroads would have bought rails much more freely at a considerably lower price, for they have not had much money to spend on rails at any price. Still we have long thought that the Association made a mistake in keeping the price so high. The popular notion is that the Carnegie people have now got ready to cut the price of rails, as it not long ago cut the price of beams, and that it proposes now to reap the fruit of expensive preparation, including in that preparation the Homestead strike. Its mills are now efficient and run by what is practically non-union labor, and are in a position to control prices. Various authorities estimate the cost of making steel rails to-day at from $20.50 a ton to $25.50; that is, including maintenance and interest charges and a reasonable allowance for bad debts. We should suppose that $25 was nearer the cost price than $21, but it is probable that the cost is far enough below $25 to make it possible for the best equipped mills to sell at that price and make a living profit.

The Massachusetts Mileage Ticket Act.

On June 15, 1892, the Legislature of Massachasetts passed what has been generally known as the Interchangeable Mileage Act. Doubts were expressed at the time about its constitutionality, and the Old Colony was so confirmed in these doubts that it firmly refused to obey the law. The Attorney-General of the State filed an information against the company to compel it to comply with the act, to which the company in reply set up that the law was unconstitutional and void.

The object of the act in question, as avowed in its title, was "to require railroad corporations to provide mileage tickets which shall be acceptcd for passage and fare upon all railroad lines in this Commonwealth." It required every railroad company operating in Massachusetts to have on sale, at $20 each, mileage tickets representing 1,000 miles, which were to be received for fare upon all lines in the State as well as upon the line of the company issuing the ticket, and under like conditions. The company issuing the ticket was required to redeem it or any part of it, when presented by any other company. Power was given, however, to the Railroad Commissioners, upon petition of any company affected, to exempt such company from the provisions of the act, if, in the judgment of the Commissioners, the public welfare or the financial condition of the road required it. The act was to take effect Oct. 1, 1892.

The proceedings referred to were before the Supreme Court of Massachusetts, and its decision has lately been handed down, sustaining the contention of the Old Colony and declaring the act unconstitutional The substance of the decision was published in our last issue.

The most formidable objection the Court found to the act was that it authorizes one railroad to determine the condition on which another railroad, without its knowledge or consent, must carry passengers. It was hardly less objectionable that any company, by this act, might at any moment, without its consent, be deprived of its right to receive its fare in money and be compelled to look for payment to the solvency of the company issuing the ticket. This was justly characterized by the Court as taking private property for public use without just compensation, and therefore prohibited by the Constitution.

The dissenting opinion defends the law on the ground that it is a proper regulation of public business, designed to promote the convenience of the public and reduce the cost of transportation. It argues that the risk of pecuniary loss to one company from carrying a passenger on the credit of another is so inconsiderable as to be unworthy of attention, and instances the fact that every railroad does business on the credit of other railroads to a much larger extent than could be done under this act.

These arguments hardly deserve notice. Boiled down, they amount to this: That an act cannot be unconstitutional if its purpose is good; that private property may be taken for public use, without compensation, if in the estimation of the legislature too much of such property will not be taken; and finally, the legislature can force railroads to observe contracts that they haven't made and know nothing about until called upon to fulfill them, because they have seen fit to make other contracts of which they do know and have approved.

If these views were to obtain generally, railroad companies would be at the mercy of legislatures, and constitutional guaranties upon which thousands of dollars are invested and even our lives depend would amount to nothing whenever popular clamor or partisan spite was sufficiently strong to break down these safeguards. We must adhere to strict construction in these matters, and happily the courts of the greatest authority and wisdom have so held.

One of the most objectionable features of this Massachusetts law seems not to have been sufficiently emphasized by the Court. It was that provision which allowed the railroad issuing the ticket to determine the conditions upon which it might be used on other roads. The law made such conditions as binding upon other roads as if they had been made by them. This appears at once to divest every company of the right to manage its own line, and subjects the conduct of its business to other and perhaps unfriendly hands. It is frivolous to say in answer to this objection that such divested right will not probably be exercised to the prejudice of the other road. No company can be called upon lawfully to run such a risk, whether great or small. And by a long line of authorities from the earliest times the test of constitutionality is not the probabilities of to-day, but the possibilities of to-morrow and forever.

This case deserves great attention, not only because it is firmly and closely planted upon the very foundations of our public and private life, but also because it is a strong bulwark in the way of encroachments by the legislature upon private rights, now getting to be unhappily prevalent. It has come quietly as an authority, but it has come to stay. It is an assurance to all the world that there reside somewhere in our system the power and promise of justice, and a great deal of good common horse sense; enough at least to invest money on, and to give to railroad companies as well as to others the right to make their own contracts and attend to their own business.

The Maximum Balance for Slide Valves.

An interesting paper was lately read by Mr. R. P. C. Sanderson, Division Superintendent of Motive Power of the Norfolk & Western Railroad, before the Southern & South Western Railway Club, on the "Balancing of Slide Valves." It appears on another page. The writer has arrived at the obvious conclusion that more pressure can be removed from the top of balanced slide valves by balancing plates or other devices than is now common practice. The valves on the Norfolk & Western, it is said, have 110 sq in. of balanced area. The area of the exhaust port and the two steam ports is 100 sq. in.; thus, the area of the balanced portion is greater than the sum of the areas of all the steam ports. Mr. Sanderson estimates that the balanced area could be 50 sq. in. greater than at present. He lays down the rule that the area that can safely be balanced is about equal to the "area of the two steam ports plus twice the area of the exhaust port." Probably this rule is a safe one to follow in locomotive work until we have more experience with valves having this increased amount of balance. It is such an important matter, and an experiment is so easily made, that it seems worth while to try valves with greatly increased balancing to learn what is the maximum balance that can be used.

From the theory of balancing, determined from experiments already made, it would appear that Mr.

Sanderson's rule is about correct. Tests have shown that where a plate covers an aperture with the steam pressure on one side and a less pressure on the other, the pull required to lift the plate from its seat is somewhat greater than the area of the aperture multiplied by the difference in pressures on the two sides. The explanation that has been offered for this is that the joint between the valve and the seat is not perfect, and the effect of lower pressure reaches under the plate around the edge of the aperture for some distance. Particularly is this the case where a heavy lubricant is used and the valve has been worn and does not fit the seat perfectly. If a plate 4 in. in diameter be placed over an aperture 2 in. in diameter, with steam pressure on one side and the atmospheric pressure on the other, the pull required to remove the plate from its seat, supposing that the flat seat is as large as the 4-in. plate, will depend entirely upon the fit of the plate to the seat. If the fit be perfect around the edges of the aperture the pull required to move it from its seat will be the total pressure on the 2-in. circular area, but if the fit be imperfect for a half inch away from the edge of the aperture, and perfect outside of that point, the pull required to remove the plate from its seat will be two and a quarter times greater, or equal to the total pressure on a 3-in. circular area. It is not necessary that the plate be concave so as to be perceptible, but only that the fit be so imperfect that steam, air or water under pressure can find its way through the minute space between the plate and the seat. From this it will appear that when a valve is somewhat worn a greater area of balance can be used than when the valve is new and has become well fitted to its seat after enough service to smooth down the face of the seat and valve.

Take now a valve like that shown in Mr. Sanderson s paper. No. 1 or 2; it will be seen that when there is no pressure in the cylinders, the area of the entire aperture is equivalent to the length of the steam port multiplied by the distance from the outer edge of one steam port to the outer edge of the other. In the case of valve No. 1 this amounts to 144 sq. in. To this should be added an allowance for the inaccuracy of fit of the valve to its seat, to get the total effective unbalanced area. The amount to be added is uncertain, depending of course upon the length of the time the valve has been in service. If we assume it to be 10 per cent., then the final total unbalanced area will be about 158 sq. in. Mr Sanderson's rule is 148 sq. in., leaving about 10 sq. in. unbalanced. It happens in the case of locomotive valves that "twice the area of the exhaust port" is a little more than the sum of the area of the bridges; therefore that rule corresponds very closely to the theoretical deduction before mentioned, which is based on experiments. It is a little more accurate to say that the balance which can be safely removed is equal to the total area between the two outer edges of the two steam ports, although in fact it only amounts to the same thing in locomotive work as Mr. Sanderson's rule. In the case of valves where the Allan port is used, as in valve No. 2, even more balance can be used as the area of the Allan port is added to the unbalanced area.

It is not best to rely too confidently on these rules, but they will serve as a guide for a beginning of experiment. In following these rules, if it is found that too much or too little balance has been used, a correction can be made by using thicker balancing strips on the top of the valves and reducing the thickness of the strips where they bear against the balancing plate, either on the outside or the inside, according to whether it is desired to reduce or increase the amount of balance.

In some cases recently it has been found that the valves lift when the compression is high toward the end of the stroke, particularly when the engine is running at high speed, and more especially with compounds, where the compression in the high-pressure cylinder is greater than in single expansion engines. This lifting does no particular harm, and in some forms of compounds it is perhaps an advantage; otherwise the compression pressure would rise much above the steam-chest pressure before reaching the end of the stroke.

The great importance of reducing the friction of slide valves by balancing has not been brought out as it should be. There is no excuse for the friction of a locomotive in all its bearings being more than 12 per cent., and leaving out the journal friction it ought not to be more than 6 per cent. of the power of the engine. It has been pretty clearly shown that large unbalanced slide valves have a friction amounting to from 7 to 20 per cent. of the power of the engine according to the size of the valves and the efficiency of lubrication. Large stationary engines do not generally have more than 10 per cent. internal friction, including the friction of the main bearings. The less friction of such engines is undoubtedly largely the result of better balancing of the slide valves. The power of a locomotive at high speeds is limited not so much by the boiler, many locomotives having more than sufficient steam, as by the reduction of the cylinder power due to wire drawing, compression and internal friction. An increase of power of 8 or 9 per cent. brought about by the reduction of the internal friction by a better balancing of the slide valves will so add to the hauling power at high speeds as to increase materially the usefulness of a locomotive.

Some interesting tests of the friction of slide valves were made by the Chicago, Burlington & Quincy road several years ago. Important tests have been carried on by Mr. J. A. F. Aspinall, of the Lancashire & Yorkshire Railroad, England, and published in the Proceedings of the Institnte of Civil Engineers of Great Britain in 1888. Experiments showing the pressure on unbalanced valves were made by Prof S. W. Robinson in 1882 and published in Transactions of the American Society of Mechanical Engineers, vol. IV., p. 150. All these experiments will be found interesting to those who are investigating this subject.

The Collision on the Rock Island.

Railroad disasters are not confined to the World's Fair season, and we are reminded of the fact by the rear collision on the Chicago, Rock Island & Pacific at Seventy-first street, Chicago, on the evening of Nov. 8, where the total number of dead is now reported as 12 and of badly injured 23. Thus the results are as bad as those of the Manteno disaster of Sept. 18.

And, although these were both regular trains, while one of the trains at Manteno was a "World's Fair" train; though this collision was on a busy section of road, near the terminal, while the other was out on the prairie, where old time conditions prevail, the root of the trouble was the same in both cases. A time interval rule was relied upon to keep the trains apart under conditions which left but little margin for miscalculation or negligence on the part of engineman and brakeman.

We print in another column the report we have received from Chicago. Since then we learn from press dispatches that a fusee was dropped by the brakeman and was picked up and thrown upon the other track by a 13-year-old boy; and that the boy, confessing the facts in court and being ignorant of the use of fuses, was discharged by the judge. This is a clear explanation of how the collision occurred and we have no doubt that it will ease the brakeman's conscience. We can hardly blame him very severely, as he naturally regarded the fusee as an effective warning and did not think so far as to consider the possibility of its failure in consequence of mere petty mischief. But, nevertheless, he probably disregarded a plain rule. We do not know the rules of the Rock Island, but the standard code says the fusee is an extra danger signal, and this collision affords a good illustration of the wisdom of thus characterizing it, as the train in question stopped two orthree times at stations, giving the brakeman ample opportunity to use torpedoes as well as fusees. The intention of the framers of the rules was, undoubtedly, to have the usual light *according to the rule;* the torpedo used as an auxiliary to the light, and the fusee as an auxiliary to both. But, as we have heretofore remarked in discussing this general subject, it is not to be wondered at that brakemen fail to fix all the details in their minds in precisely the proper order, and so we come back to the same argument that we have so many times pressed, that a radical change in principle is the only satisfactory way to reform the method of preventing rear collisions. Under the time interval we inevitably come back, in every case, to one of the most elementary questions in discipline.

This question is: How can we make a flagman go back when he knows that the engineman, if ordinarily careful, will need no warning? and how can we make an engineman reduce speed when he feels perfectly sure that there is no danger of running over anything bigger than a torpedo? On the Illinois Central the stations where the time interval should have been maintained were far apart, and on the Rock Island they were near together; but the spirit which leads men to take a risk adjusted itself to the differing conditions to produce the same danger in both cases.

With sufficient time and money it is possible for the right kind of a superintendent to train the men to more intelligent cautiousness, and on some of the smaller roads this seems to have been done; but somehow time and money and the right kind of a superintendent do not seem to concur very often, and we must therefore conclude that those roads which have given up the idea of improving the time inverval system and have made the radical change to the space interval have taken the only true course.

It is true that in abandoning the time interval, because of the difficulties in perfecting it, we do not avoid the troublesome question of expense; but we do simplify it, and that is one of the real points gained. The Rock Island has within the past year spent considerable sums for automatic block signals (at other places on the road); so evidently the operating officers recognize the *principle* of the space interval. Apparently they have not yet convinced their directors that the space interval is in the long run safer with ordinary men than the time interval is with first-class men.

Loss Due to Radiation from Steam Boilers.

It is not our intention now to enter into a discussion of the theoretical losses due to radiation of heat from steam boilers or to say anything about the relative merits of different kinds of boiler coverings, but simply to call attention to the nature of the losses and to show how the amount of loss may be judged. Generally losses by radiation are not appreciated unless the radiation is very intense. If the radiating surface is red-hot, although small in area, the steam user will be impressed, will make an investigation and will try to put a stop to the loss; but if the radiation is less intense and the radiating surface of a normal color, although large in area, the loss generally goes on without much attention.

A case of this kind at the World's Fair will answer for our present purpose of illustration. One of the most advertised boilers, for which many claims of economy are made, is also one of the largest, being about 15 ft. in diameter outside of the setting and approximately 30 ft. high. The outside surface of this boiler has an area of nearly 1,200 sq. ft. It is covered with iron and the exterior is so hot that water will stand on it in its spheroidal state; that is, it is much hotter than the temperature of steam at 200 lbs. pressure, and some parts of it are just about at blue heat. Yet in the face of this condition and while in the presence of the boiler at full blast, the promoters of this steam generator will explain and expound its superiority in matters of economy over other generators in the same building the setting walls of which are scarcely up to the boiling point of water. If the heat that is being radiated continually from the 1,200 sq. ft. of surface was concentrated to 10 sq. ft., this surface would be at a bright red heat, and the promoter would stand aghast. It may be accepted that the maximum economy and efficiency of a steam boiler will not be obtained when the surface of the outside of the boiler is so hot as to cause water to bubble and boil violently when thrown upon it. More particularly is this so where the exterior of the boiler is exposed to a low temperature. It is a bad sign when a boiler-room has to be ventilated by opening the doors and the skylights. Most of us have seen cases where in cold weather boiler-houses were very hot with the doors, windows and ventilators all open, and yet no part of the exterior surface of the boiler or setting was as much as red-hot or even at a blue heat.

No class of boilers is more badly neglected in this respect than those used on locomotives. The extreme case is when, as in the Northwest, a locomotive boiler is left uncovered about the firebox for fully one-third of its area of surface and is only partially protected over the ramainder of the surface by a very inefficient wooden lagging, when the thermometer ranges from 30 to 40 deg. below zero. Locomotive boilers as used in railroad service are much less efficient than the ordinary stationary boiler, for two reasons: there is a loss due to the greatly forced combustion and to the radiation from hot surfaces. This has unjustly given the locomotive boiler in some quarters a reputation for inefficiency, as has been proved by the performance of that type when used in stationary plants where its surfaces are thoroughly covered with a considerable thickness of heat insulation. All this is not very novel, as most mechanics understand that radiation from hot surfaces of steam boilers is a source of loss, but it is interesting to compare the boilers at the World's Fair in the matter of radiation. The difference in the temperatures of the surfaces of the settings is so great that there must be a wide difference in efficiency of the different boilers.

Slower Time Between New York and Boston.

The New York, New Haven & Hartford has notified the New York & New England and the Boston & Albany that the trains running between New York and Boston over those roads in five hours and 40 minutes must be made six-hour trains, and has thereby kicked up a big row in Boston and in the other cities affected.

The preliminary rumors were to the effect that both the day and the night trains running through between Boston and Philadelphia by the Harlem River boat transfer were to be taken off and that other reductions of train service would be made. The story seemed reasonable, because the New England road announced simultaneously that the through night train between Boston and Washington over the Poughkeepsie bridge was to be taken off, and the New Haven road has made some reductions of force in the shops, thus showing that the hard times have really affected the business of the company. The Poughkeepsie bridge train is really to be taken off, but the officers of the New Haven road say that the Philadelphia trains over their line are not to be disturbed. The earnings of the New Haven have fallen off about 10 per cent., but the discharge of men from the shops—about 150 at New Haven and 100 elsewhere—is the only serious reduction of force that is to be made. The night express between Boston and New York, which now runs as two separate trains, is to be consolidated into one.

In the matter of the trains over the two competing roads the New Haven is not so overbearing as the newspapers try to make it appear; and yet it is clear that it is intended to "squeeze" the other roads, at least a little. When the New Haven road put on the 2 o'clock train over the Shore line, running through in 5⅝ hours, it allowed the Boston & Albany to put on a similar train, starting at 12 o'clock. These trains were both $6 trains, there being no common passenger cars on them. The New England road complained, and the time of the 3 o'clock train over that road was shortend to 5¾ hours. In this the New England was unduly favored, as the 3 o'clock train has common cars, while the other two trains have not. In putting these trains on a six-hour schedule it is presumably intended to run common cars on all of them. But the 2 o'clock train is to be set back an hour, starting at 3, and is to be hauled on the New Haven road by the same engine that takes the New England train. This will humble the pride of the "White train," whether it hurts its business or not. Likewise, the 12 o'clock train (B. & A.) is to be consolidated on the New Haven road, with the 12:03 train, which goes over the New York & New England, so that both of the New York & New England trains will have a competitor starting at the same hour. The natural remedy would seem to be for the New England to make faster time over its own portion of the line; but, so far as we can judge from the statements of the officers, the contract under which the through trains are run will not permit this. By this change there will be six six-hour trains between New York and Boston (though only four starting from New York), and the only quicker train will be the five hour train of the Shore line, starting at 10 a. m., on which the fare is $7.

While the complaints made in Boston, Springfield and elsewhere are well founded, the grievance is not a very big one, and it will be difficult to force a square fight. It is conceded that 3 o'clock is the most popular hour for a train to start, but the New York & New England will still be in a position to advertis its shortest line and other advantages, for the New Haven engines can draw all the cars that may be needed to accommodate the passengers, and it is not likely that the New Haven road will discriminate in selling tickets. The claim that to properly perform its duty to the public, the New Haven must always treat the New England road and the Boston & Albany just as well as it treats its own line, parallel to theirs, will be a hard one to enforce. It is true that in England the courts have enforced such a requirement where the damage to the public interest was palpable and serious; but, unless the injury is decidedly serious, the right of each company to the fruits of its own enterprise comes in as a counter claim which cannot be evaded. In the Little Rock & Memphis case the Interstate Commerce Commission decided (March 25, 1889) that there was no law to compel a road to thus favor a connection which was at the same time a competitor; and the clause in the Interstate Commerce Law (Section 3) exempting a road from furnishing terminal facilities to a competitor, was doubtless inserted with the intention, more or less definite, of protecting the railroads, in cases of this kind, against any unreasonable demands that might be made by the public. And in the present case the New Haven road is probably warranted, by a falling off in business, in making a reduction of service somewhere, and the New England has challenged it to aggressive action by threats of building a competing line through to New York. The Boston & Albany is really the road which has the best ground for complaint.

Annual Reports.

Wheeling & Lake Erie.—The annual report of this company is for the year ending June 30, 1893. The miles operated were 247 as compared with 243 in the previous year. The chief results of operation are as below:

Gross earnings	$1,578,645	Increase	12.25 per cent.
Operating expenses	1,009,383	"	14.25 "
Net earnings	$529,262	"	.87 "

The ratio of operating expenses to gross earnings was 65.6.

Dividends were paid to the amount of $180,000 on preferred stock, and $32,000 was added to the surplus, making it now $151,000. The gross earnings per mile were $6,229 as compared with $5,643 the year before. The net earnings per mile were $2,142 as compared with $2,005. The increase of tonnage was 14.26 per cent., and of ton miles 23.2 per cent., the tons hauled in 1893 having been 2,107,314, and the ton miles 241,865,774. The company carried 1,367,958 tons of bituminous coal during the year, the increase in the year having been 89,323 tons. Of this total tonnage 743,522 was from the Wheeling, Lake Erie & Pittsburgh Coal Co.'s mines, that corporation being an auxiliary company. Bituminous coal constituted nearly 65 per cent. of the total tons carried by the company. The next largest item was lumber, which made 6.5 per cent. and the next ores, 3.3 per cent. The freight earnings, which were 79.96 per cent. of the whole, increased 11.4 per cent., and the passenger earnings 14.3 per cent. The gross earnings have increased steadily each year since 1887, from $677,248 to $1,538,645, in which time the ton-miles have increased 88.5 per cent., and the earnings from freight have more than doubled. This has, of course, been due to the development of the coal traffic. As coal is so much the largest part of the total freight, the ton-mile rate is low, .509 cent; but, notwithstanding this persistently and necessarily low rate, the freight earnings have increased year by year in a remarkable way. Of course the empty car mileage must be great, for a company whose chief business is hauling coal one way; nevertheless the average freight train load was 215 tons, a very excellent showing. In writing lately of the Chesapeake & Ohio we collected a few characteristic train loads, which we repeat here as giving a measure of comparison: Chesapeake & Ohio, 1893, 283 tons; New York Central, 1893, 287 tons; Pennsylvania, 1892, 220 tons; Erie and New York, Pennsylvania & Ohio, 232 tons; Baltimore & Ohio, 1892 (east of the Ohio River), 121 tons; Norfolk & Western, 1892, 198 tons.

Considerable improvement has been made in the physical condition of the road, about 25 per cent. of the increase in operating expenses having been due to the cost of rebuilding freight cars and passenger coaches and 3,000 ft. of trestle having been filled. A large division terminal yard is about completed at Massillon, O., and the company expects to provide during the coming year additional facilities which are needed to handle the traffic.

Missouri, Kansas & Texas.—This report is for the year ending June 30, 1893, and is especially interesting as showing the remarkable progress made toward the complete rehabilitation of this property. The average miles operated were 1,712 as compared with 1,674 the year previous. The principal results of operation are as below.

		Increase. Per cent.
Gross earnings	$10,388,191	6.4
Operating expenses	7,810,735	0.6
Net earnings	2,577,456	8.0
Surplus	238,047	20.0
Gross earnings per mile	6,068	4.0
Net earnings per mile	1,506	6.0
Ratio, operating expenses to earning.	75.2 per cent.	

From the report it appears that heavy charges have been made to operating expenses on account of extraordinary expenditures for betterments. These amount to $843,219 and include $87,000 for rails, $262 000 for bridges, $210,000 for equipment. Therefore the percentage of operating expenses is not to be taken as the normal ratio. "The important work of construction has been completed during the year and the system emerges from the construction of more than 300 miles of new line entirely free from floating debt or financial embarrassment of any kind." The company now has a continuous line from Kansas City and Junction City and from Hannibal, to Galveston, the International & Great Northern having been enjoined by the court from interfering with the company's trains running over the Galveston, Houston & Henderson from Houston to Galveston. The Missouri, Kansas & Eastern has been turned over to the operating department and the company has arranged to use the terminals in St. Louis of the Chicago, Burlington & Quincy, a contract having been made for a long term of years. It is expected that the Bellefontaine Bridge over the Missouri will be completed about Dec. 1, whereupon the M., K. & E. will at once be operated as the main eastern outlet of the Missouri, Kansas & Texas system.

While the total gross earnings increased 6.4 per cent. the earnings from freight increased 7.6, the tons 17.14 and the ton-miles 15.21 per cent. The ton-mile rate, however, fell from 1.121 cents to 1.046. This decline in rate is attributed to the large increase in coal, bulk grain and lumber, and to a decrease in the freight taking high rates. The revenue from coal was $1,420,534 out of a total freight revenue of $7,876,357. Live stock yielded the next greatest revenue, being $1,380,686, and the earnings from cotton, lumber and grain follow in the order mentioned, these five commodities having yielded more than half of the total freight revenue. The total ton-miles were 652,445,014, an increase of 15.6, and the passenger-miles were 69,134,637. The rate per passenger-mile was a trifle higher than in the preceding year, having been 2.74 cents.

Considerable effort has been made to increase the passenger travel. The entire passenger equipment has been fitted with the quick acting brake, and a contract has been made for supplying steam-heating equipment throughout. The sleeping car service is now performed by Wagner cars, that company having furnished an equipment of entirely new cars on terms much more favorable than the former arrangement under which the sleeping car service was worked. It is expected that the mileage charges on sleeping cars will be reduced by about $25,000 a year. Seven new vestibuled trains were put on the road, and a fast through service established from Galveston to Chicago. Considerable improvements have also been made in the freight equipment, 745 cars having been equipped with air brakes and M. C. B. couplers. On the main line 63 and 65 lb. rails have replaced the light rails north of Denison, leaving at the close of the year but 100 miles of light rail in the Indian Territory. Many of the principal bridges were renewed with heavy permanent structures, permitting a great increase in average freight train haul. Altogether the improvement in the financial and physical condition of the company appears to have been very satisfactory.

Manhattan Railway Company.—This company report, for the year ending Sept. 30, 1893, the results of operation as follows:

Gross earnings		$11,137,051
Operating expenses and taxes		6,210,160
Net earnings		$4,926,891
Interest on bonds and rental		2,015,075
Balance (9.7 per cent. on $30,000,000 capital stock)		$2,911,816
Dividends:		
Six per cent. on $30,000,000 capital		$1,800,000
Surplus		$1,111,816
Operating per cent., including all taxes	55.76	
Passengers carried:		
Second Avenue Line	33,314,555	
Third Avenue Line	82,833,988	
Sixth Avenue Line	78,002,478	
Ninth Avenue Line	20,308,196	
Total Manhattan lines		214,459,217
Suburban branch		5,161,800
Grand total		219,621,017

It appears, from reports published since our last issue, that the transfer of the Chesapeake, Ohio & Southwestern to the Louisville & Nashville is to be practically a formal purchase by the latter company, the Illinois Central joining in certain guarantees and in return receiving valuable traffic rights. The road extends from Louisville, Ky., southwest to Memphis, Tenn., by way of Paducah, 392 miles. It was a part of the Newport News & Mississippi Valley line, which Mr. C. P. Huntington and his friends established between Memphis and the Atlantic Seaboard, but which fell to pieces, the lines east of Louisville being now the Chesapeake & Ohio. The Louisville & Nashville already has a line from Louisville to Memphis, but it is no doubt glad to purchase the parallel road to keep it out of the hands of hostile interests, and also to secure the terminal properties of the purchased line in both cities, which are said to be worth over $1,000,000. The Illinois Central needs this connection to make a direct line from Memphis to Cairo and Chicago. It has a line from Memphis to its main line, but the connection is at Grenada, about 100 miles south of Memphis. This makes a direct line from Memphis southward, but it is too roundabout for traffic to and from the north. The principal branch of the Chesapeake, Ohio & Southwestern is the Ohio Valley road, extending from Henderson, on the Ohio River, opposite Evansville, Ind., southward to Hopkinsville, Ky., crossing the main line at Princeton. The terms of the present agreement are said to be as follows: The Louisville & Nashville is to pay to Mr. Huntington $6,000,000 as purchase money, and also guarantees the interest on the first mortgage six per cent. bonds, which amount to $6,000,000, and receives from Mr. Huntington the capital stock of the road ($6,000,000 common and about $3,700,000 preferred), and also the second mortgage bonds, of which $3,865,000 have been issued. Ten year four per cent. notes, issued by the Louisville & Nashville for this purchase money, will be guaranteed by the Illinois Central, and that company will receive collateral trust notes, secured by the deposit of the stock and bonds of the Chesapeake, Ohio & Southwestern, and the securities owned by it. The gross earnings of the Chesapeake, Ohio & Southwestern were very nearly the same in each of the last two years, a little less than $2,300,000 in 1892, and slightly more in 1891. The traffic for 1892, however, decreased from exceptional causes; the freight earnings falling off nearly $35,000 from 1891. The net earnings increased $83,000, being $823,000. The net income was $868,000, and after paying interest and other charges, there was a deficit of $18,000. No dividends have been paid on either class of stock. The per cent. of operating expenses to gross earnings has varied in the last five years from 57.9 to 68, the latter figure being in 1891. In 1892 it was 64 per cent. The gross earnings per mile have been between $5,033 in 1888 and $5,800 in 1891, being $5,771 in 1892. The through traffic of the road is 14 per cent. of the total. The coal traffic is increasing, and was 400,000 tons last year, or five per cent. of the total freight carried.

Among the really interesting incidents of railroading, looked at from the standpoint of the "scrap editor" of the average daily paper, are those cases where a freight train loses a whole car without the knowledge of the trainmen. Items of this sort are always eagerly seized and the skillful way in which they are amplified and idealized affords first class amusement to the reader, while the practice gained by the editor is valuable to him when he comes to enter the higher literary circles. Sympathizing with this laudable ambition to furnish

the public with a kind of truth which is stranger than fiction, we take pleasure in noting an item of this sort which recently appeared in a Pittsburgh paper. Being desirous of eliminating all unnecessary fiction we made inquiry of an officer of the road on which the accidents occurred, and what follows has been fully confirmed. Our esteemed contemporaries will notice that these two accidents occurred on the same road, on the same night, making, as it were, a brilliant "double combination." It was on the night of Oct. 7. A west bound freight of the Pittsburgh, Fort Wayne & Chicago, on arriving at Alliance, O., was found to have one empty box car under which there was only one truck. Investigation brought to light the fact that the truck jumped out on a descending grade, near Garfield, and had sufficient momentum to carry it completely across the adjoining main track and into the ditch. No other damage was done. This is a stunning argument in favor of the link and pin coupler, as a vertical plane coupler must inevitably have let the car body down upon the rails. The other accident occurred near Massillon. While descending a grade, the men on the rear cars discovered that the train had parted and went out to set the brakes. The first brakeman had gone only one or two car lengths, when there was a shock which knocked him down and extinguished his lantern. He recovered, however, and was setting another brake, when there was a second shock, the forward portion of the train having been stopped by a train ahead of it, and the two parts running together. Two cars were damaged and the conductor, in examining his list preparatory to setting them off, found that he was short two cars. They were found about two and a half miles back, standing clear of the main track. These cars also were empty, and it is supposed that they were derailed by a drawbar falling on the track. The momentum of the cars behind them pushed them clear of the track and the connection was broken without any injury to the draft rigging. The night was quite dark, so that the two men on top of the train passed by the unruly cars without noticing them.

One of the oldest railroad employees' relief associations is the "Relief Fund" of the Lehigh Valley Railroad (including also the Morris Canal Co.), and, as a correspondent has made inquiry concerning the character of this organization, we give herewith the main facts as recently furnished to us by an officer of the road. The scheme is far less elaborate than that in force on the Pennsylvania, the Philadelphia & Reading, the Chicago, Burlington & Quincy and other roads, but it seems to be well liked by those men who have joined it, and it has one feature, the payment by the company of a sum equal to the total contributions of the employees, which is different from anything of the kind in the other organizations. In this principle the Lehigh Valley follows the example of the large English railroads. The Lehigh Valley Relief Fund is to provide only for accidental injuries and deaths. Any employee may at any time pay in any sum less than $3. The company will duplicate his subscription and will make new assessments as often as the fund is used up. Each class of employees—as engineers, brakemen, track foremen, mechanics, etc.—may elect one of their number as a representative who, with the division superintendent, will manage the fund as regards that class of employees. The railroad company keeps the fund and manages it, at the expense of the road. A member disabled receives from the fund three-fourths as much per day as he contributes on each assessment, but these benefits will not continue more than nine months for one injury. In case of accidental death $50 is paid at once, and the family receives money equal to the prescribed disablement benefits for two years. There are provisions for furnishing artificial limbs, and limiting payments where a widow remarries. The payment on each assessment insures up to the time of the next assessment. Members can withdraw at any time. The road, in consideration of furnishing half of the fund, stipulates that it will not give any aid to any employee who has refused or neglected to join. The late Hon. Asa Packer, President of the road, left in his will a provision for furnishing a home at St. Luke's Hospital, South Bethlehem, for superannuated employees. Few have availed themselves of this, however, as most of those thus retiring have been provided for by their families. The last annual report of the Relief Fund shows that there were two assessments made during the year, the amount contributed by employees being $18,571. The payments for the same year were $40,235. The number of contributors was 5,281.

An explosion of a gas motor in the barn of the North Chicago Street Railway Company last week entailed a loss of $68,000. Fire was communicated to the barn; and the barn, together with 38 cars and 16 other motors, was burned. The motors were what are known as the Belgian gas motors and were used in the street car service on the North Side on some of the streets well out from the business center and where the traffic is comparatively light. We mentioned recently that residents on those streets had petitioned the Chicago City Council to prohibit the use of the motors, the petition stating that they emitted a terrible stench and frightened horses so frequently that it was dangerous for pedestrians to pass on the streets.

NEW PUBLICATIONS.

The Twenty-Fourth Annual Convention of the Master Car and Locomotive Painters' Association, September, 1893.—The proceedings of this Convention are issued from the office of the *Painter's Magazine*, New York. The volume contains 54 pages, being a complete report of the papers and discussions, and is bound in cloth, a very good notion, and one that we wish could be followed by other societies. The Secretary is Robert McKeon, Kent, O.

Standard Tables for Electric Wiremen. With Instructions for Wiremen and Linemen, Underwriters' Rules, and Useful Formulæ and Data. By Chas. M. Davis. Fourth Edition, revised and edited by W. D. Weaver. New York: The W. J. Johnston Co. Flexible morocco. 128 pages. Price $1.

The third edition of this little handbook was exhausted within a few months after its issue, and the fourth edition has been delayed in order that it might contain the latest revisions of the Insurance Rules of the Underwriters' International Electric Association, now almost exclusively used in the United States. In addition to the above rules there has been added to this edition a section on the calculation of alternating current wiring. A number of the most important tables were prepared expressly for this work and are copyrighted.

Poor's Directory of Railway Officials and Purchasing Agent's Guide. Edition of 1893, 8th annual number. New York: H. V. & H. W. Poor. Price $3.

Poor's Directory published as a supplement to Poor's Manual of Railroads has been so long before the public that its characteristics are doubtless well known to those who have occasion to use such a publication. As a reference list it has some peculiar advantages in its typographical arrangement, making it one of the most convenient to use. A new feature introduced this year is a classified index to the leading manufacturers of railroad appliances which is said to be the most complete and comprehensive buyer's guide ever compiled. This buyer's guide covers 148 pages and is certainly a very full and well classified list of the materials manufactured for the uses of railroads and allied industries. In the guide, articles and materials are classified alphabetically and under each title is the name and address of the person or firm manufacturing it or dealing in it.

The guide to the names and titles of railroad officers is also well classified and the directory includes city and suburban tramways of all sorts, foreign railroads, private railroads, railroads projected and under construction, besides other departments.

The World's Railway.—We have said before that a record of the really magnificent collection of models, reproductions, drawings, etc., made by the Baltimore & Ohio Railroad Company for exhibition at the World's Fair is to be preserved in a volume under the title of "The World's Railway." We have received from Maj. J. G. Pangborn sample pages and a descriptive circular of the *édition de luxe*, of which a limited number of copies will be issued at the price of $25; this edition will not be put on sale otherwise than by subscription. The book, like the exhibition itself, will be remarkable in its execution as well as in its plan. It will have some 300 illustrations, half of which will be in three colors, and will show the evolution and development of motive power from the first idea of steam propulsion on land (Sir Isaac Newton, 1680) to the 100-ton locomotive of to-day. It will illustrate also the evolution and development of permanent way and equipment, and will contain portraits of men identified with railroad progress. The volume will have 160 pages, 11 × 14 in., printed on handmade, Japan, vellum paper. We are informed that the aggregate expenditure on the collection itself and on this description will reach nearly $120,000, which we can well believe. While we trust that the collection will be kept together, we are very glad to know that the next best thing has been done in the preparation of this record, to which railroad officers and students of railroading ought to subscribe liberally, not only for the sake of this invaluable addition to their libraries, but also in some recognition of the great service which the company and Major Pangborn have done to railroad history. Communications with regard to it should be addressed to Maj. J. G. Pangborn, Baltimore, Md.

A Practical Treatise on Foundations; explaining fully the Principles involved. With Descriptions of all the most Recent structures, etc., etc. By W. M. Patton, C. E., formerly Professor of Engineering at the Virginia Military Institute. New York: John Wiley & Sons, 1893. Pages 402, alphabetical index and many plates.

Probably all civil engineers will admit that the best method of obtaining a thorough and comprehensive knowledge of foundation work requires a careful study of works executed or attempted to be executed; indeed, it is almost certain that they would prescribe that procedure as the *only* method. Evidently the author of this work entertains those views to a very large extent, as by far the greater portion of the volume is devoted to descriptions and studies of substructures and foundations built chiefly under his design and supervision. There is some theoretical matter relating to the pressure of earth against retaining walls, and the stability of the latter, as well as a little of the same character relating to the theory of the arch; but 25 or 30 pages of the work, out of 400, will include all of a theoretical nature which the book contains. In many respects this is fortunate, for about all the theory that judiciously can be applied to foundation work is already sufficiently elaborated. At the same time this aspect of Colonel Patton's book should not be taken to indicate that theoretical considerations have no place in the design and construction of foundations. They have a very important part to play in that field of engineering; and inasmuch as theories based upon ideal conditions can only be efficiently modified to fit practical conditions, and so made to be of the greatest practical use, when thoroughly understood, it is quite rational to maintain that the experienced civil engineer is much better equipped to deal with difficult foundation problems if he has a thorough theoretical knowledge of the things he must control than if he has less, and that of an indifferent character. We infer from much that is found in the book that the views of the author are in essential harmony with those just expressed, and, consistently with them, we can recommend the work to the favorable consideration of those engineers who have to encounter difficult foundation problems.

The first three-fourths of the volume are devoted to a very complete treatment of "Foundation Beds," with their proper unit loads; the uses, proper proportions and methods of mixing concrete; building stones and masonry, quarrying, ice and wind pressure against piers, retaining walls, arches, cements and mortars, timber foundations, timber coffer dams, open caissons, soundings and borings, timber trestles, pile work, and all minor or secondary matters related to those divisions of substructure work. We are glad to observe the insistence which the author makes on the preliminary examinations of proposed foundation sites by means of soundings and borings. There is nothing of so much importance to the correct determination of a proper location and design of a foundation as a complete knowledge of the material in which it is to be located down to, and *into*, the hard stratum on which it is to rest.

The last 125 pages of the book will probably be considered as interesting and valuable as any, and perhaps more so, since they relate to the more unusual and difficult foundation methods, such as deep open crib work, pneumatic caissons and caisson sinking, iron piers, Poetsch freezing process, some of the late methods of dealing with quicksand, foundations for high buildings, and a résumé of the subject of pile driving in its analytical and empirical aspects which have received such extremely thorough treatment during the past year or two. The treatment of these special matters is very satisfactory for the reason that effective methods for meeting characteristic contingencies are fully described and all descriptions are accompanied by plates prepared from working drawings. The detailed designs of coffer dams, open caissons, pneumatic caissons and methods used to correct displacements of the latter in sinking will be found in such shape as to be of great service.

Along with other practical information there are complete statements of costs of all grades and classes of work. These prices are taken from actual contract awards and they apply to the work executed. In common with all costs of engineering constructions they are subject, of course, to the influences of local conditions, and they should be regarded accordingly.

TRADE CATALOGUES.

Duty Tests of Triple Expansion Pumping Engines. The Edw. P. Allis Co., Milwaukee, Wis.

Frequent mention has been made in engineering circles during the past few months of the exceptional economy shown by the Allis triple expansion pumping engine at North Point Station, Milwaukee, during the tests made by Prof. R. C. Carpenter in March last. The Allis company has lately printed and issued under the above title a detailed report of this test. The engine, as mentioned in the *Railroad Gazette* of March 31, 1893, is of the vertical type, with a rated capacity of 18,000,000 gallons in 24 hours. The cylinders are side by side and 28, 48 and 74 in. in diameter, with a stroke of 60 in. The test was of 24 hours' duration, and the water pumped against a head of 153.56 ft. was 18,528,657 gallons. The consumption of dry steam per horse power per hour averaged 11.678 lbs.—probably the best authentic results on record. There is also given a copy of the expert's reports upon the tests of the three 15,000,000-gall. pumps of the same type in the Fourteenth Street Pumping Station of Chicago. These engines, on a 48-hour test, showed an average consumption of 11.97 lbs. of dry steam per horse power per hour, and a duty of 148,958,000 ft.-lbs. per 1,000 lbs. of feed water.

New Police Boat, Patrol for New York Harbor.

The new boat, Patrol, for police duty in New York Harbor, is to be launched on Saturday of this week at the Maryland Steel Company's works, Sparrows Point, Baltimore, and is to be delivered in the middle of January.

She will be one of the most complete and serviceable boats ever designed for such purposes, and will take the place of the old side-wheel boat of the same name, now in service.

The Patrol is 143½ ft. long over all, 135 ft. between perpendiculars, 23 ft. beam and 10½ ft. deep amidships. She is built of mild steel plates, Lloyd's tests,

is double-plated forward as a protection against ice, and has four water-tight bulkheads. The boat is driven by two compound surface-condensing engines, guaranteed to be 500 H. P., and to give a speed of 15 to 16 miles an hour. The cylinders of each engine are 13 in. and 24 in. in diameter by 18 in. stroke. The high pressure cylinders have piston valves, and the low pressure have double-ported, Frick-pattern valves. The screws are of cast iron alloyed with steel scrap, 6 ft. diameter and 9 ft. pitch. The boat has steam steering gear of the Manton pattern, and a very complete electric lighting system, with a search light of 4,000 C. P. The steam is furnished by two gunboat boilers, 7 ft. 9 in. diameter × 17 ft. 6 in. long, which are to be tested for 120 lbs. pressure. Each boiler has two 36-in. corrugated furnaces. The piping from the boilers to the engines is so adjusted that the latter may be run separately or together, valves being so placed that in case of accident to either boiler or either engine they may be run independently. The boat is supplied with a Worthington duplex fire pump, with steam cylinder 14 in. diameter, water cylinder 9¼ in. diameter × 10-in. stroke, which will throw 1,000 gallons a minute with a pressure of 150 lbs. The boat is thoroughly equipped for fire service and can be utilized for wrecking.

The boat is built on very graceful lines, is straight at the bow for protection about the docks, has two masts, 60 ft. in height, and looks every bit a staunch sea going craft. She has a men's saloon forward, and a women's saloon aft, with adjoining state rooms and lavatories, and below are the dining-room, kitchen, mess room and officers' quarters.

The cost of the boat is thought to be very low. The General Meigs, a Government boat, 11 ft. shorter, had no search light or steam steering apparatus, and cost $66,000; the price of this boat complete is $55,000. The boat was designed by the Maryland Steel Company, Marine Department, with Mr. H. de B. Parsons, M. Am. Soc. M. E., as consulting engineer, under whose supervision the boat has been built.

TECHNICAL.

Manufacturing and Business.

In our issue of Nov. 3, page 798, in the article on the new Wickes refrigerator car, the name of the Wickes' Refrigerator & Car Co. was by mistake printed "The Wickes' Refrigerator Car Co." The address of this company is Room 8, "The Rookery," Chicago.

The Hallstead Novelty Co., of Hallstead, Pa., was chartered at Harrisburg last week. It will manufacture, among other things, Hamlin's locomotive engineer's seat. The directors are G. M. Hallstead, John A. Mears and James P. Dickson, of Scranton, and others.

It may be that we have failed to make special mention of the awards received by the Safety Car Heating & Lighting Co., at the World's Fair. The company received a medal and diploma for its lighting system (Pintsch gas) and also for its car heating system and for the Gibbs coupler. World's Fair medals are not a novelty for the Pintsch system, it having received among other awards the following: Grand Gold Medal, Moscow, 1872; Progress Medal, Vienna, 1873; Gold Medal, St. Petersburg, 1875; Society of Arts Gold Medal, London, 1877; Gold Medal, Cincinnati, 1881; Highest Reward and Special Mention, Atlanta, 1881; Gold Medal, Bordeaux, 1882; Chicago, 1883, Gold Medal for "superior and most comprehensive compressed gas system for railways;" Berlin, 1883, Gold Medal, Hygiene Exposition; London, 1883. Fisheries Exhibition, Medal.

The Alberta Railway & Coal Co., which is changing 100 miles of its road to standard gauge, will soon be ready to dispose of the present narrow gauge equipment, which includes over 300 cars and a few locomotives.

The works of the Mason Air Brake Co., at Elgin, Ill., will, it is announced, be reopened shortly, probably next week.

The directors of the Litchfield Car & Machine Co. have formally ratified the agreement made with the Memphis Business Men's Association for the removal of the car plant from Litchfield, Ill., to a suburb of Memphis, Tenn. This action settles the question of the removal to Memphis, and the only point now to be decided is whether to build new shops or to attempt to remove the present buildings. We have it on excellent authority that it is only proposed to remove the car plant, and that arrangements have been made to have the Litchfield Machine Co. remain in Litchfield.

Iron and Steel.

The Inland Steel Co. has been formed to take over the rolling mill of the Chicago Steel Works, at Chicago Heights, Ill. The capital stock will be $130,000. Steps are now being taken to complete the organization.

R. C. Neal has been appointed Receiver of the Harrisburg Rolling Mill Co., Harrisburg, Pa. It is understood that this a move toward resumption. The mills have been shut down three months.

The annual meeting of the Reading Rolling Mill Company and of Cofrode & Saylor, Incorporated, took place at Philadelphia this week. The stockholders of the latter concern re-elected their directors, Joseph H. Cofrode, Francis H. Saylor and Henry R. Leonard. The Rolling Mill Company elected seven directors, of whom two, Ellis Ames Ballard and Edward J. Kelly, were new. The other re-elected directors were Joseph H. Cofrode, Francis H. Saylor, Josiah F. Bailey, Charles A. Sterling and G. W. Bush.

The Montour Iron & Steel Co. has just resumed operations in its rolling mills at Danville, Pa., giving employment to 600 men. Nearly all the other large iron industries there are now in operation also. Four more furnaces at the Ellis & Lessig puddling mill, in Pottstown, have resumed work, making 22 now in operation. At the Pottstown Iron Company's Works the Hope Mill, which has been idle for several months, has been started up.

The Marlin Iron & Steel Co., of Allegheny City, was chartered last week with a capital of $40,000. The directors are Henry A. Marlin, Francis D. Marlin, John B. Chapman and Perry O. Laughner, of Pittsburgh, and Elmer E. Laughner, of Coraopolis, Pa.

The plant of the Whitaker Iron & Steel Works at Wheeling, W. Va., was very seriously damaged by fire on Nov. 12. The loss is estimated at $85,000 with $70,000 insurance.

New Stations and Shops.

The Pittsburgh Reduction Co., manufacturers of pure aluminum, has let the contracts for building its new shops at Niagara Falls, N. Y. Three buildings will be erected at present. James Stewart & Co., of Niagara Falls, have the contract for the masonry work and Debbie & Stewart, of the same place, the contract for the structural iron.

Work on the superstructure of the new Delaware & Hudson station at Scranton, Pa., has been begun.

The Frost Carburetor System for Postal Cars.

The Atlanta & West Point and the Western Alabama roads, which have all their passenger cars lighted by the Frost system, are now equipping their mail cars with the Frost dry carburetor light.

The Contracting Chill.

Engineering for Oct. 27 contains illustrations and descriptions of Barr's contracting chill and of his grinding machine for car wheels, with both of which our readers are doubtless familiar; at any rate they ought to be if they have followed the literature on the subject as it has appeared in the *Railroad Gazette*. The tables of average mileage and of foundry loss are, however, brought up to a date later, we believe, than anything yet published in America. In 1887 about half the wheels were cast in the contracting chill, and in 1889 and since then practically all of them were cast in the contracting chill. Table 1 shows the foundry loss, the very rapid diminution of which will appear from the last column. Table 2 shows the mileage got from all wheels scraped, except those slid flat, taken from passenger car service. In both cases it will be observed the improvement was fast before the contracting chill was used, but so far as the tables go they indicate an immense improvement due to the chill.

TABLE 1.—FOUNDRY LOSS AT WEST MILWAUKEE FOUNDRY.

Date.	Made. No.	Loss. No.	Percentage of loss.
1883	24,651	2,329	10.43
1884	29,453	2,485	9.21
1885	32,017	2,481	8.40
1886	29,021	2,285	8.55
1887	34,299	1,796	5.53
1888	35,987	547	1.54
1889	35,008	209	.60
1890	30,479	221	.73
1891	36,986	157	.43
1892	37,622	108	.29

TABLE 2.—MILEAGE OF WHEELS SCRAPPED.

Date.	Number.	Average mileage.
1885	1,676	45,731
1886	1,058	70,468
1887	889	85,055
1888	836	100,455
1889	941	106,916
1890	1,081	101,919
1891	1,828	103,252
1892	2,308	107,445

The Illinois Steel Company.

The Joliet mills of the Illinois Steel Company will resume work on Nov. 27, giving employment to about 1,800 men. The company has considerable raw material at these works, and it is the intention to convert this into finished product. Whether the mills will continue longer than the time required to work up the present stock depends entirely upon orders. It is not known when the rail mills and the new plate mills at South Chicago will begin operations. The officers of the company give it as their opinion that the recent reduction in the price of steel rails by several firms will not stimulate materially the demand for rails.

Interlocking on English Railroads.

The last annual report of the Board of Trade shows that throughout the United Kingdom the total number of junctions, connections or crossings of a passenger line or any other is 41,356; 6,315 of these are cases in which the passenger line is connected with or crossed on the level by another passenger line; 25,891 are cases in which the passenger line is connected with or crossed on the level by goods lines or sidings, and the balance, 9,150, represent the crossover tracks.

The usual requirements of the inspecting officers of the Board of Trade have been complied with in 39,829 instances, so far as regards the concentration of signal and point levers, leaving only 1,527 cases where such requirements are not met. In 40,000 instances the proper precautions have been taken concerning the interlocking of signal and point levers, and, out of the total of 25,891 cases in which goods lines or sidings are concerned, 24,829 have safety points also. Moreover, of the remaining cases, viz., 1,062, not thus included, many are provided with interlocked scotches, scotch blocks worked from the signal cabin, Annett's lock and key, fork locks, or other precautionary appliances.

With regard to the interlocking of signal and point levers, the proportion now interlocked of the total in England and Wales was, at the end of 1892, 98 per cent., being an advance of 1 per cent. on the previous year. On the Scotch railroads the proportion has risen 5 per cent., from 88 per cent. to 93 per cent., while Ireland shows even better progress, for while only 68 per cent. were interlocked in 1891, this increased by the following year to 90 per cent., giving a total percentage for the United Kingdom of 97 per cent.

Chicago Main Drainage.

Three million dollars worth of 5 per cent. bonds are to be issued by the drainage trustees to be expended through the winter. They are to be of $1,000 each, and date from Jan. 1, 1894. A report on the recent trip of the trustees down the Illinois River has been presented. The Board of Commissioners of the Illinois & Michigan Canal has addressed a petition to the Senators and Representatives in Congress from Illinois in regard to the dams already constructed on that canal. After stating that $2,000,000 had been spent on the construction of these dams the petition suggests that no more money should be expended on the construction of these dams, but that the efforts of the national government should be directed toward deepening the channel of the river, especially between the dams.

Wood-Working Machinery.

The controversy going on in the industrial newspapers between the English and American manufacturers of wood-working machinery, as to the merits of their respective machines, is interesting, and will probably end in good results. Criticism even if given *hot* is stimulating and a good tonic. According to a letter by Mr. Frederick Danner in the Cincinnati *Commercial Gazette*, one of the prime movers in this attack upon American wood-working machinery is a manufacturer of kindling wood choppers and emery grinding machines. The letter also states that it is a common practice (and he cites special instances in proof of his statement) for English firms to adopt American patterns of machinery, and he names leading firms who have employed American designers in wood-working machinery. He also recites that American designs of machinery are illustrated in the catalogue of English firms. He reputes the statement that castings in the United States cost more than in England by comparing the prices of castings abroad with those of Cincinnati. The statement that labor is higher priced he acknowledges, but says that an American does more work than an English or German mechanic in the same time. He replies to the charge that Americans use babbitt metal where the English use brass bushings, by giving his personal observations that in 1889 the London & Northwestern was using babbitt metal bushings on to the connecting rods of its locomotives; and that it was Yankee babbitt metal at that. He gives some of the advantages of babbitt metal over brass bearings, especially in matters of repair. He concludes with some cases of balancing displayed in English machines that have come to his own attention, and, after explaining how the Englishman does it, tells how an American manufacturer would accomplish the same thing.

Measuring Bridge Vibrations by Photography.

According to the *Annales des Travaux Publics*, Prof. F. Steiner, of Prague, has successfully applied photography to the measurement of bridge vibrations under moving loads. He uses for this purpose small glass balls about an inch in diameter, which are brightly illuminated either by a ray of sunlight or of some artificial light. The glass balls so illuminated show up very distinctly on the sensitized plate of a photographic camera. One such ball is fixed to the bridge member or other object whose vibrations are to be determined. The camera objective is then so placed that an image of the ball is obtained on the right-hand side of the ground glass plate. A sensitive plate is then introduced into the camera, the cap is removed from the lens at the moment that the vibrations begin, and the camera is turned on its pivot from right to left. The negative obtained then shows an undulating line, which is really an image of the successive vibrations of the glass ball. If, at the same time, a second ball, suspended from a fixed point, be made to vibrate, the duration and amplitude of the vibrations being known, and if an image of these vibrations also be obtained on the same plate, provision being, moreover, made to have the images of the two balls coincide when in a state of rest, then the second undulating line by comparison with the first will serve as a measure of the number of vibrations made by the first ball in a certain length of time.

Practically, there is some difficulty in making the images of the two balls coincide at the time of the beginning of the vibrations. In order to do away with this Professor Steiner has introduced a modification of the method, which consists in swinging before the source of light which illuminates the vibrating glass ball a pendulum which, at regular known intervals, cuts off the light. The image of the undulating line will thus be interrupted at distances apart corresponding to one vibration of the pendulum. All the requisite data for measuring the vibrations of the glass ball are thus obtained. It makes no difference whether the camera is turned at a uniform or an irregular rate of speed, as the relations of two images, when the two balls are used, are always the same.

Cable Road Improvements in Chicago.

On the night of Nov. 11, the cable was laid in the new loop around which the West Madison street cars will be run. This loop branches off from the old one at

Madison and La Salle streets and runs east in Madison to State, north on State to Washington, where it goes west through the tunnel. The Milwaukee avenue cars only will continue to run over the old loop. The cables of both will run side by side in the same conduits to La Salle street where the West Madison street cars will be switched off by an ordinary hand switch. The new cable was fastened in the grip of a car at 2:30 A. M. and was drawn around the loop by 25 spans of horses. By daylight it was in place and ready to start, but another thorough inspection was made and the first car was not run over the line till about 10 o'clock. Things, however, were not satisfactory, and it was not till evening that cars were running regularly. This loop crosses the north side line at four places and flagmen have been stationed at these points to prevent collisions. Both the old and the new cables are run by the power-house at Washington and Jefferson streets, the new one causing an additional load of about 100 H. P. on the engine.

Work on the new tunnel at Van Buren street is being pushed as rapidly as possible, a large force of men being at work on the approach west of the river. The track and conduits for the loop for this road are completed, and when in operation the cars will be run north on Franklin to Adams, east to Dearborn, south to Van Buren and then west through the tunnel. The Blue Island cable cars will be run in this way, they at present being run only to the power house at Clinton and Van Buren streets, and the passengers transferred to horse cars, crossing the Monroe street bridge. All this activity in cable roads is caused by the opening of the Lake street elevated and their efforts to secure the West Side traffic.

New York & New Jersey Bridge.

The adjournment of Congress left the New York & New Jersey bridge bill in conference committee. The bill passed by the Senate contained several amendments to the House bill. On a vote of non-concurrence by the House of Representatives the bill went into conference and there was no time to come to any agreement. The bill does not lose its place and will come up again in regular order in the first days of the session which begins in December.

The Louisville & Jeffersonville Bridge.

Shopwork and work on the erection of the river spans for the Louisville & Jeffersonville Bridge Co. is being pushed, with the expectation of completing the erection before high water in January. Three river spans are complete and work is now in progress on the three remaining spans.

THE SCRAP HEAP.

Notes.

The Old Colony has entered civil suits in the courts against John M. Washburn, its defaulting Treasurer, and against his bondsmen.

A special train of the Baltimore & Ohio Southwestern ran from East St. Louis to Washington, Ind., on Nov. 6, 165 miles, in 165 minutes; and it ran through to Cincinnati, 341 miles from St. Louis, in less than seven hours.

"The Anthracite Coal Operators' Association" has been formed by about 60 of the principal independent anthracite operators. The combined production of these concerns for last year was 11,345,000 tons. The President of the new association is William Connell, of Scranton, Pa.

The Mullan tunnel, of the Northern Pacific, which was blocked by a cave-in in Oct. 14, was cleared Nov. 4. On Nov. 7 the tunnel again caved in. This road and other roads in the Rocky Mountains and Eastern Washington have also been interrupted by washouts, a heavy storm having prevailed there Nov. 7.

A press dispatch from Bucyrus, O., states that the Pennsylvania Company has closed the block signal offices recently established on the Western Division of the Pittsburgh, Fort Wayne & Chicago, and discontinued running trains by that system. The reason given is that passenger business is very dull.

A passenger train of the Illinois Central was stopped by robbers near Mayfield Junction, Ky., on the morning of Nov. 11, and the express car robbed of about $7,000. A passenger train of the Peoria, Decatur & Evansville was stopped by robbers near Lincoln, Ill., on the night of Nov. 13 about 9 o'clock. A brakeman who resisted them was fatally shot and the passengers were terrorized for several miles, the robbers having ordered the engineer to run the train to the next station.

The Committee of the American Railway Association which is investigating the subject of interlocking and block signals met in New York last Saturday, and the members inspected the signals on the New York Division of the New York, New Haven & Hartford, the Hudson Division of the New York Central and the Hudson River Divison of the West Shore. This body is a joint committee from the Committee on Safety Appliances and the Committee on Train Rules. On Monday the committee inspected the signals on the Pennsylvania road between Jersey City and Elizabeth and on the Central of New Jersey between the same points.

The Mobile & Ohio, whose employees have been grumbling since last August, when they received notice that their pay would be reduced at the end of 60 days, is said to have promised to restore the old rates on March 1 if the men will accept a reduction of eight per cent. until that time. It is said that the wages on this road are as good as on those other roads in that territory which made a reduction of 11 per cent. some time ago. The strike on the Chicago & Southeastern has been settled. The General Manager of the Wisconsin Central announces the restoration of wages to the rates which were in force previous to the reduction made last August. The restoration takes effect on Nov. 1.

Scientific Freight Stealers.

The officers of the Houston & Texas Central have discovered a novel scheme by which cars have been robbed of cotton in transit. On a grade near Hempstead they found a contrivance by which bales were grappled and hauled off the cars as they moved slowly up grade. The bales were taken to a farm near by, repacked and shipped by another line to Houston and Galveston. Four negroes were captured, and other arrests are likely to be made. At the point named there is a heavy grade, with steep banks on the sides, densely covered by brush and timber. The apparatus used is a system of chains with grappling hooks anchored to stakes in the ground. The cotton being carried on platform cars the hooks are thrown into the bales and they are dragged off. One night one train lost eight bales. The officers expect to bag bigger game than the negroes. Thousands of dollars worth of cotton have been stolen by the gang already.

Various Railroad Accidents.

A passenger train jumped the track Nov. 8 near Mikhailov, Government of Ryazan, Russia, and 24 carriages and the locomotive rolled down a bank. The ruins caught fire. Six passengers were burned to death, fifty were injured, and the engineer and fireman were scalded to death.

A stock train, running from Naples to Rome, Italy, was derailed Nov. 8 near Cassine, and thrown into a river. The train was being drawn by two engines, both of which, together with four cattle wagons, were wrecked. The enginemen and cattlemen, five in all, were killed. The accident was caused by a storm that had weakened the supports of a bridge.

The London office of the Buenos Ayres & Rosario Railway (Argentina) has been informed from Buenos Ayres that a train on that line was derailed on Nov. 6 at a point about 125 miles from Buenos Ayres. Ten persons were killed, and 46 injured.

The Railroad Mail Service.

The annual report of J. Lowrie Bell, the Second Assistant Postmaster-General, shows that the total expenditure for mail transportation was $43,597,997. Of this amount $5,758,718 was on account of star routes and $25,716,605 on account of railroad routes. The report shows that there are now in operation 18,656 star routes, aggregating 249,859 miles in length; 2,529 railroad routes, aggregating 166,952 miles; 7,295 mail messenger routes, aggregating 5,726 miles; 2,212 special office routes, aggregating 20,030 miles. The increase in the number of routes during the year was 989, and in the length of routes 6,241 miles. The increase in the annual expenditure was $2,262,625. During the last fiscal year the railroad post office cars were subjected to 403 train accidents. Ten clerks were killed, 66 seriously injured and 115 slightly injured.

Systematic Tramping.

SAN BERNARDINO, Nov. 3.—Three hundred and fifty tramps arrived in Colton to-day on their way to New Orleans, where they expect to find work on the levees. These men come from San Francisco and vicinity, their numbers being augmented along the route. Many of them appear to be honest. They are well organized into companies with captains and have regular rollcalls. Their officers serve two meals each day, all sharing alike when they have anything to eat. They secure food by sending delegates to the authorities of the cities through which they pass. Such a delegation visited this city and were given a hundred pounds of bacon, sacks of potatoes, beans, coffee, etc., which was conveyed to their camping ground in an express wagon.

The Southern Pacific officials permit them to ride on freight cars. Their appearance and orderly conduct enlists general sympathy, and their wants are being supplied. They made a stop here to secure provisions to carry them across the deserts of Arizona and New Mexico.—*San Francisco Examiner.*

A Steel Furnace Blown Up at Braddock.

The furnace of the Edgar Thomson Steel Works at Braddock, Pa., blew up Nov. 9, creating a panic among the Hungarians who live near the works. The whole top of the furnace was blown off, and iron and cinder scattered in every direction. One employee was badly injured. The furnace had been "hanging," and when the great masses of cinder came down the pressure was too great and it lifted the massive iron top off the furnace. Coke and cinder in a molten slab was thrown all about the bottom of the furnace.

The Paris Fair of 1900.

The French committee which has in charge the matters relating to the preliminary organization of the exposition to be held in Paris in 1900 has confirmed the site selected by the sub-committee, and the site has also been approved by the Minister of Commerce. The site will include the Champs de Mars, the grounds of the Palais du Trocadero, the Quai d'Orsay, the Esplanade des Invalides, the Quai de la Conference, the Cours la Reine and the Palais de l'Industrie.

CAR BUILDING.

The Laconia Car Co. has received an order to build 300 box cars for the Fitchburg road.

The Philadelphia, Reading & New England has ordered 100 coal cars from Ralston & Henry, of Philadelphia.

The Long Island has issued specifications for a large number of passenger cars. The number to be built is not yet decided, but most of them will be open cars for excursion traffic.

BRIDGE BUILDING.

Atlanta.—The project for a bridge over the Central of Georgia, at Alabama street, which has been agitated for a number of months, has again been brought up in the city council, and it is said that the project is now more likely to be carried out than before. It would appear from the local papers that the council has decided to accept the plans for the bridge prepared by the American Bridge Co. and H. T. McDaniel, but before an appropriation can be made for the structure an amendment of the city charter will have to be secured from the state legislature.

Bloomsburg, Pa.—A county bridge will be erected over the Susquehanna River, at or near Hendershott's Ferry, this place.

Duluth, Minn.—Three plate girders 86 ft. long and 8 ft. 6 in. deep have just been placed by the Youngstown Bridge Co. to carry the ore traffic of the Duluth, Mesaba & Northern over the St. Paul & Duluth tracks.

Mendelssohn, Pa.—Application will shortly be made for a charter for the Mendelssohn & Glassport Bridge Co., which proposes to construct a railroad and wagon bridge across the Monongahela River, between the two towns. Among those interested is D. P. Corwin, of the Pittsburgh, Virginia & Charleston road.

Tacoma, Wash.—The Board of Public Works has let the contract for constructing the Union avenue bridge to Alexander Gillard, the lowest bidder, whose bid was $5,332.

Utica, N. Y.—Four bids were received for building the iron bridge over the Erie Canal in Genesee street, Utica, for the construction of which the legislature appropriated $45,000. The lowest bidder was the Hilton Bridge Co., of Albany, at $37,450, to whom the contract was awarded. The other bidders were: Dean & Westbrook, New York, $44,000; Kellogg Iron Works, Buffalo, $57,230; Berlin Iron Bridge Co., East Berlin, Conn., $58,200.

RAILROAD LAW—NOTES OF DECISIONS.

Injuries to Passengers, Employees and Strangers.

In Pennsylvania it appears that plaintiff, a lady 60 years old, was a passenger on defendant's mixed train; that at her destination defendant had no depot or platform; that where the train stopped the snow was very deep, and the engine cut loose from the train, and left it standing; that most of the passengers passed over four flat cars and walked away; that a brakeman beat down the snow by the passenger car for her to stand until an engine removed the forward cars; that, after standing there some time, she objected to remaining longer; that the brakeman suggested that if she could pass over the flat cars she could leave the train, and told her there was no other way of leaving it; that he carried her packages and assisted her to alight, and that in getting down from the car her clothes caught in the coupling pin, causing her to fall. The Supreme Court rules that plaintiff was not a discharged passenger, and that the railroad is liable.[1]

The Supreme Court of Missouri rules that where mail bags are customarily thrown from the cars upon a certain platform over which passengers are expected to pass, it is the duty of the railroad company to guard against accidents caused by passengers stumbling over such bags in the dark, even though the bags are thrown out by postal clerks in the service of the post office department[2].

In Texas the Supreme Court rules that it is error to charge that the company is bound to furnish competent men to handle its trains and the appliances for switching trains which experienced railroad men have found are best adapted for that purpose, as the company is only required, in the selection of its employees and in furnishing appliances, to use such care as an ordinarily prudent man would use under the circumstances.[3]

The Supreme Court of California holds that when the section crew of a railroad side track a hand car with which they are working to clear the track for an approaching train, and the section foreman, who has unlocked the swith, negligently fails to close it, and the train enters on the side track and kills a section hand, the section foreman is personally liable in damages for his death.[4]

In Missouri plaintiff, an engineer on defendant's railroad, having observed water running from the tank of his engine, without stopping the train took a position outside his cab for the purpose of correcting the defect, and while there was struck by a cattle-guard fence. The Supreme Court holds that the engineer was not, as matter of law, guilty of contributory negligence in failing to stop the train, and then correcting the defect, when he had no knowledge of the proximity of the fence to the track.[5]

A Louisiana statute requires railroad companies to provide separate coaches for the white and colored races, and provides that the conductor shall assign each passenger to the coach to which he belongs, and that he may refuse to carry any passenger who refuses to occupy the coach assigned to him, and exonerates the company from damages by reason of such refusal by a conductor to carry a passenger. The Supreme Court holds that the statute did not bind a passenger to accept a wrongful assignment, or exempt the conductor from liability for damages in case of a wrongful assignment and refusal to carry.[6]

In Alabama the Supreme Court rules that where a woman in an enfeebled condition has not time to alight from a railroad train during the stop at her place of destination, and leaps therefrom after the train again gets in motion, without any warning to the conductor or other employee, she is not entitled to recover damages against the company for injuries caused thereby.[7]

In Arkansas in an action for the death of a brakeman in the employ of defendant railroad, it appeared that the accident occurred in defendant's yard; that the ties in the yard lay exposed above the ground; that at the place of the injury crooked ties had been put down, their exposure being greater and the track rougher and more dangerous than elsewhere in the yard; that if the space between the ties had been filled the danger of making couplings would have been reduced; and in some other similar yards on defendant's road such spaces were filled. The Supreme Court rules that there was evidence of negligence on the part of defendant in thus maintaining its yard.[8]

In Texas it is held that where a fireman on a locomotive, injured because of a defect in the coupling between the locomotive and tender, is not precluded from recovery from the company because the engineer was negligent in failing to inspect the coupling; since, this being the duty of the company, such negligence of the engineer is its negligence, and not the negligence of a fellow servant.[9]

In Georgia the Supreme Court rules that where a railroad furnished a contractor engaged in extending its line an engine and train, upon which a fireman already in the service of the company was, by it, ordered to work, the company is liable for personal injury to him caused, while obeying this order, by reason of defects in the engine, attributable to the company's negligence, though the extension was in possession of the contractor, and the operation and movements of the train were under the latter's exclusive control.[10]

In Kentucky it is held by the Court of Appeals that the failure of plaintiff to use, in making couplings, a coupling stick, the receipt of which he had acknowl-

edged in writing, and promised to so use, was not such negligence as would bar his right of recovery, where, at the time he signed such writing, he was told that it was required as a mere form, and where, in order to use such stick, it was necessary for a brakeman to carry it about his person in a belt, which caused more danger of falling while running on top of a car than was compensated by its security against injury in making couplings.[11]

In Indiana while the front brakeman of a train was signaling with his lantern, the light went out. He started to the engine to relight it, when the engineer put on the air brakes, and suddenly stopped the train, causing the brakeman to fall from the car. The Supreme Court holds that the proximate cause of the accident was not the sudden stopping of the train, but the extinguishment of the light in the lantern, as it brought on and set in motion the intermediate series of incidents that resulted in the brakeman's injuries, and the railroad is not liable for the lantern going out.[12]

In North Carolina the Supreme Court holds that where an engineer sees, walking on the track in front of the engine, a woman whom he does not know at all, or who is known by him to be in full possession of her senses and faculties, he is justified in assuming, up to the last moment, that she will step off the track in time to avoid injury, if there is nothing apparent to him that can prevent her getting off the track; and if she is injured the railroad company is not liable.[13]

The Supreme Court of Missouri rules that a city has the power, as a police regulation, to limit the speed of railroad trains within its limits by ordinance, so long as the same is not unreasonable, and an ordinance limiting the speed of such trains to six miles an hour is both reasonable and humane.[14]

In Arkansas it is laid down by the Supreme Court that it is not negligence for a railroad company to omit to keep a lookout to prevent boys from swinging on the ladders of its slowly moving freight trains.[15]

In Virginia it is held that where plaintiff's own act of coupling between cars without a stick was the proximate cause of his injury, the fact that his fellow brakeman gave a signal for backing the cars without first ascertaining whether plaintiff was between them, in violation of defendant's rules, will not impute negligence to defendant.[16]

In Arkansas the Supreme Court rules that where a brakeman was injured while at work on some flat cars that were being pushed ahead of an engine, he cannot recover if the risk was within the scope of his employment and if he knew, when he entered the service of the road, that it was its custom to push flat cars in that way; but if he was ignorant of this custom when he entered the service of the road, or of facts which ought to have apprised him of it, and the custom was improper, and exposed him to unnecessary hazard when performing the duties assigned to him, he did not, in such case, assume the risk, and can recover if free from contributory negligence.[17]

In Virginia plaintiff, a brakeman, was injured while attempting to couple with a "short shackle," which he was holding up with his hand instead of using the coupling stick, as the rules of the defendant railroad required. The injury would not have happened if he had used the coupling stick. The Supreme Court rules that he could not recover.[18]

In Alabama, plaintiff, a brakeman, was sent ahead of his train with a red lantern and a white lantern to signal an incoming train, and claimed that while in the discharge of his duty he became sick and fell in an unconscious condition on the track, where he was run over, and that the lanterns both remained on the track so that the engineer should have seen them and stopped. The Supreme Court holds that a rule from defendant's book of rules providing that "a lamp swung across the track is the signal to stop" was competent evidence on the question of negligence on the part of the engineer.[19]

In Oregon it is held by the Supreme Court that where a track walker of defendant railroad, while crossing its bridge, saw an approaching engine half a mile away, and thinking he could get across, started to run, and fell and hurt his leg, and then stepped on one of the bridge caps placed along the bridge for that purpose, where he remained in safety, and he had ample time after sighting the train to retreat or step on a cap, he cannot recover on the ground of the insufficiency of the rules of the company to protect track walkers in not providing for the frequent whistling of engines before approaching bridges, his injury not having been caused by the want of such rules.[20]

[1] Harzig v. L. V. R. Co., 26 Atl. Rep., 310.
[2] Sargent v. St. L. & S. F., 21 S. W. Rep., 823.
[3] G. C. & S. F. v. Schwabbe, 21 S. W. Rep., 706.
[4] Daves v. So. Pac. Co., 32 Pac. Rep., 708.
[5] Murphy v. Wabash R., 21 S. W. Rep., 862.
[6] Ex parte Piessy, La., 11 South. Rep., 948.
[7] L. & N. v. Lee (Ala.), 12 South. Rep., 48.
[8] St. Louis, I. M. & S. v. Robbins, 21 S. W. Rep., 886.
[9] S. & E. T. v. Ewing, 21 S. W. Rep., 700.
[10] Sav. & W. v. Phillips, 17 S. E. Rep., 82.
[11] L. & N. v. Foley, 21 S. W. Rep., 856.
[12] Penn. Co. v. Congdon, 33 N. E. Rep., 795.
[13] High v. Car. Cent., 17 S. E. Rep., 79.
[14] Gratiot v. M. P. Ry., 21 S. W. Rep., 1091.
[15] Catlett v. St. L., I. M. & S., 21 S. W. Rep., 1062.
[16] R. & D. v. Pannill, 16 S. E. Rep., 748.
[17] Fordyce v. Lowman, 20 S. W. Rep., 1090.
[18] Norfolk & W. v. Briggs, 16 S. E. Rep., 748.
[19] Helton v. Alabama Midland (Ala.), 12 So., 276.
[20] Gibson v. O. S. L. & U. N., 32 Pac. Ref., 295.

MEETINGS AND ANNOUNCEMENTS.

Dividends:

Dividends on the capital stocks of railroad companies have been declared as follows:

Chicago, Burlington & Quincy, quarterly, 1¼ per cent.

North Pennsylvania, quarterly, 2 per cent., payable Nov. 25.

Toledo & Ohio Central, quarterly, 1 per cent. on the common stock, payable Nov. 25.

Stockholders' Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

Baltimore & Ohio, annual, Baltimore, Md., Nov. 20.

Buffalo, Rochester & Pittsburgh, annual, New York City, Nov. 20.

Grand River Valley, special, Jackson, Mich., Jan. 10.

New York, Lake Erie & Western, annual, New York City, Nov. 28.

New York, Pennsylvania & Ohio, annual, Cleveland, O., Dec. 6.

Technical Meetings.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The *Central Railway Club* will meet at the Hotel Iroquois, Buffalo, N. Y., on the fourth Wednesday of November.

The *Western Railway Club* meets in the rooms of the Central Traffic Association, Monadnock Building, Chicago, on the third Tuesday in each month, at 2 p. m.

The *New York Railroad Club* meets at the rooms of the American Society of Mechanical Engineers, 12 West Thirty-first street, New York City, on the third Thursday in each month, at 7.30 p. m.

The *Northwest Railroad Club* meets at the Ryan Hotel, St. Paul, on the second Tuesday of each month, except June, July and August, at 8 p. m.

The *American Society of Civil Engineers* meets at the House of the Society, 127 East Twenty-third street, New York, on the first and third Wednesdays in each month.

The *Canadian Society of Civil Engineers* meets at its rooms, 112 Mansfield street, Montreal, P. Q., every alternate Thursday.

The *Technical Society of the Pacific Coast* meets at its rooms in the Academy of Sciences Building, 819 Market street, San Francisco, Cal., on the first Friday in each month, at 8 p. m.

The *Tacoma Society of Civil Engineers and Architects* meets in its rooms, 201 Washington Building, Tacoma, Wash., on the third Friday in each month.

The *Association of Engineers of Virginia* holds informal meetings the third Wednesday of each month, from September to May, inclusive, at 719 Terry Building, Roanoke, at 8 p. m.

The *Boston Society of Civil Engineers* meets at Wesleyan Hall, Bromfield street, Boston, on the third Wednesday in each month, at 7:30 p. m.

The *Western Society of Engineers* meets at 78 La Salle street, Chicago, on the first Wednesday in each month, at 8 p. m.

The *Engineers' Club of St. Louis* meets in the Odd Fellows' Building, corner Ninth and Olive streets, St. Louis, on the first and third Wednesdays in each month.

The *Engineers' Club of Philadelphia* meets at the House of the Club, 1122 Girard street, Philadelphia, on the first and third Saturdays of each month, at 8 p. m.

The *Engineers' Society of Western Pennsylvania* meets at its rooms in the Thaw Mansion, Fifth street, Pittsburgh, Pa., on the third Tuesday in each month, at 7.30 p. m.

The *Civil Engineers' Club of Cleveland* meets in the Case Library Building, Cleveland, O., on the second Tuesday in each month, at 8 p. m. Semi-monthly meetings are held on the fourth Tuesday of each month.

The *Engineers' Club of Cincinnati* meets at the rooms of the Literary Club, No. 24 West Fourth street, Cincinnati, O., on the third Thursday in each month at 8 p. m.

The *Engineers' Club of Kansas City* meets in Room 200, Baird Building, Kansas City, Mo., on the second Monday in each month.

The *Engineering Association of the South* meets on the second Thursday in each month, at 8 p. m. The Association headquarters are at The Cumberland Publishing House, Nashville, Tenn.

The *Denver Society of Civil Engineers* meets at 36 Jacobson Block, Denver, Col., on the second and fourth Tuesdays of each month except during July, August and December, when they are held on the second Tuesday only.

The *Montana Society of Civil Engineers* meets at Helena, Mont., on the third Saturday in each month, at 7.30 p. m.

The *Engineers' Club of Minneapolis* meets in the Public Library Building, Minneapolis, Minn., on the first Thursday in each month.

Civil Engineers' Society of St. Paul.

The regular meeting of the Club was held Nov. 6, eight members and 24 visitors being present. President Wilson introduced Maj. J. W. Howard, of the Barber Asphalt Paving Co., who delivered a lecture on "Asphalt: Its Chemistry, Sources and Uses." The substance of his address will be found in the coming report of Mr. F. J. V. Skiff, Chief of the Department of Mines and Mining of the World's Columbian Exposition.

New York Railroad Club.

The annual meeting of the New York Railroad Club will be held at 8 P. M. on Thursday, Nov. 23, at 12 West Thirty-first street. Mr. Barnes' paper on boilers will be discussed. The annual reports of the secretary and treasurer will be submitted and the election of officers for 1894 will take place.

New England Railroad Club Meeting.

At the meeting held Wednesday evening, Nov. 8, President Chamberlain occupied the chair. The President reported, on behalf of the Finance Committee, that some progress had been made with regard to the project of issuing the proceedings of the Club in book form, but owing to the illness of the Secretary the matter was delayed, and the committee would like to have further time. It was voted that they be allowed another month and report at the next meeting. The subject for discussion for the evening was announced as "Permanent Way and Rolling Stock, and Their Relation to Each Other," to be opened by Mr. J. N. Lauder. This appears elsewhere. The President announced as the subject for discussion at the December meeting "The Locomotive Boiler and Its Attachmets," to be opened by Mr. Stewart.

Master Car-Builders' Convention.

The annual convention of the Master Car-Builders' Association will commence on Tuesday, June 12, and will be held at Saratoga, N. Y., as previously announced. The hotel headquarters will be at Congress Hall, where a rate of $3 a day for single rooms has been secured. The rates for double rooms, parlors, etc., were given two weeks ago. Rooms may be engaged by addressing Mr. H. S. Clements, of Congress Hall.

Engineering Association of the South.

At the annual meeting held in Nashville Nov. 9, these officers were elected: President, Charles Hermany, Louisville; Vice-Presidents, W. C. Smith, Nashville, and J. Kruttschnrit, Houston, Tex.; Directors from Tennessee, W. W. Carson, Knoxville; Wm. L. Dudley, Nashville; E. C. Lewis, Nashville; Director from Kentucky, John B. Atkinson, Earlington; Director from Georgia, G. H. Crafts, Atlanta; Secretary, Hunter McDonald, Nashville; Treasurer, Wm. T. Magruder, Nashville,

Society of Naval Architects and Marine Engineers.

The first general meeting of this new society is in progress as we go to press. It is being held in New York at the rooms of the American Society of Mechanical Engineers, the sessions taking place Thursday and Friday. An inaugural banquet is down on the programme for Thursday evening. A very interesting list of papers is issued, among the writers being Mr. C. H. Cramp, Mr. T. D. Wilson, ex-Chief Constructor of the United States Navy; Mr. Pankhurst of the Globe Iron Works, Commodore Melville, Col. E. A. Stevens, and others whose names are well known as high authorities on the topics of which they write. The officers of the Society are: President, C. A. Griscom, of Philadelphia; First Vice-President, T. D. Wilson, U. S. Navy; Vice-Presidents, C. H. Cramp, President William Cramp & Sons; George W. Melville, Engineer in Chief U. S. Navy; G. W. Quintard, President Quintard Iron Works; Irving M. Scott, Vice President and General Manager Union Iron Works; Francis A. Walker, President Massachusetts Institute of Technology; William H. Webb, of New York, Naval Architect, retired; Secretary and Treasurer, W. L. Capps, Assistant Naval Constructor U. S. Navy. The members of the Council include many distinguished names and the Society certainly starts with great promise of being permanent and important.

Engineers' Club of Philadelphia.

A business meeting of the Club will be held on Saturday, Nov. 18, 1893, at 8 o'clock p. m. There will be a general discussion on riveting pressures required for bridge and boiler work. A paper by Mr. Pierre Giron on the Grinding of Portland Cement will probably be read. The next social meeting of members will be held at the club house on the evening of Saturday, Nov. 25.

At the business meeting on Nov. 4, 1893, 26 members and visitors were present. The tellers reported the election to active membership by Messrs. A. C. Cuningham, Josiah Dow, Edwin F. Bertolett and Grafton Greenough.

Mr. Wilfred Lewis exhibited a section of a 7-in. steel staybolt from a hydraulic riveter, which had broken in the nut about 2½ in. from the end of the bolt. The static load on the bolt was 450,000 lbs., and at the time the actual load probably did not exceed 600 lbs. It has been found by experiment that when a nut is made to come at the end of a bolt, to obtain uniform stress throughout the bolt, it is not sufficient to make its thickness equal to half the diameter of the bolt, as is generally supposed. The thickness of the nut should be at least equal to the diameter of the bolt. Mr. Lewis then explained and illustrated a method of caleulating the stress in a bolt, showing that it varied with the square of the diameter, and stated that experiments, which he believed verified the equation given, had been made by the Edge Moor Iron Works, but that he was not yet in possession of the figures. At the close of his remarks there was a general discussion on fractures of a similar character, which was participated in by Messrs. Henrik V. Loss, Edward K. Landis, Paul A. N. Winand and John L. Gill, Jr.

Mr. John C. Trautwine, Jr., with the aid of the blackboard, described the largest one of the four single track stone bridges which are being thrown across the wild and narrow valley of the River Pruth, in Galicia. This is a segmental arch, varying in thickness from 7 to 10 ft., and having a clear span of 213 ft., with a rise of about 60 ft. It was cheaper, on account of the good material at hand, to make these bridges of stone than to have them built of iron, and the one described above is believed to be the largest stone railroad bridge and the largest stone arch in existence, excepting the Cabin John Aqueduct Bridge, near Washington. In constructing the arch, the lowest or innermost ring, to avoid excessive loading of the centers, was built first, and allowed to remain for two or three weeks before the upper layers were added. These were begun at not less than four points, as the springing points and the middle of each haunch simultaneously, and the closing of the ring took place simultaneously at not less than three points.

Mr. Carl G. Barth spoke at some length on a number of cases of fracture in test specimens, and described another method of proving that the resistance to fracture in bolts and shafts varies with the square of the diameter.

PERSONAL.

—Mr. George P. Hamlin, who was Superintendent of Construction on the railroad between St. Petersburg and Moscow, in Russia, died at his home in Baltimore, Md., Nov. 12. Mr. Hamlin served as machinist's apprentice to Ross Winans, and he went to Russia in Mr. Winans service to act as Superintendent of Construction.

—Mr. Thomas C. Barr, President of the New Jersey Traction Co., and John L. Waterbury, Vice-President, have resigned. David Young was elected Vice-President to succeed Mr. Waterbury. E. N. Hill was re-elected Treasurer and Thomas H. Wentworth Acting Secretary. The office of President has been left vacant for the present.

—Mr. C. H. Howard has been appointed Division Superintendent of the new Baltimore & Ohio Southwestern line, having charge of the division between Cincinnati and Portsmouth, O., about 200 miles. Mr. Howard was formerly Superintendent of Transportation on the Baltimore & Ohio Southwestern before the consolidation with the Ohio & Mississippi.

—Mr. H. C. Barlow has been elected Vice-President of the Evansville & Terre Haute road, and it is understood that he will act as General Manager. Mr. T. D. Wheeler has been elected Chairman of the Finance Committee, and Mr. D. J. Mackay continues as President of the road, to which office he was elected at the annual meeting in September. Mr. E. O. Hopkins retires as Vice-President of the company.

—Mr. Frederic R. Coudert and Mr. J. W. Doane were this week appointed additional Receivers of the Union Pacific Railroad to represent the interest of the United States Government. Mr. Coudert is a very well-known lawyer of New York City, and was formerly a government director of the Union Pacific. Mr. Doane is a banker of Chicago, and is at present a government director of the Union Pacific.

—Mr. Edwin A. Hill has been appointed Receivers' Assistant on the Jacksonville Southeastern Line with office at Jacksonville, Ill. Mr. Hill has been recently connected with the banking firm of Hatch & Foote, of New York. Previously he was real estate agent of the Cleveland, Cincinnati, Chicago & St. Louis and he has also been Chief Engineer of the Indianapolis, Decatur & Springfield.

—Mr. Jacob H. Schiff, of the well known New York banking firm of Kuhn, Loeb & Co., for many years a director of the Louisville & Nashville Railroad, has resigned from the board. Mr. Schiff has been intimately associated with the financial management of the property, and his resignation came as a surprise when announced. He explains it by saying he could not spare the time which ought to be devoted to the property.

—Mr. T. W. M. Draper sailed from New York last week in charge of an expedition sent out by the Cachavi Company, of 40 Wall street, New York, to that com-

pany's placer property in Equador. He is accompanied by John J. Robinson, C. E., and Oscar Saabye, C. E., as assistants. The postoffice address of the party will be Tumaco, U. S. C. Colonel Draper has had an office in New York for several years as consulting engineer. He has been Chief Engineer of the Atlantic & Danville and of other railroads in the South.

—Mr. Daniel A. Olin, one of the oldest railroad men in Wisconsin, died at Racine, Wis., on Nov. 7. Until two years ago he was Assistant General Superintendent of the Chicago, Milwaukee & St. Paul road for the Racine & Southwestern Division, to which position he had risen from foreman of a gang of construction on the Milwaukee & Mississippi Railroad. He was in charge, it is said, of the first train out of Milwaukee to the Mississippi River. In 1880 he was appointed Assistant General Superintendent of the Chicago, Milwaukee & St. Paul. He was connected with that system for 24 years.

—Mr. O. V. Smith, Traffic Manager of the Seaboard Air Line system, has been granted a leave of absence, and Mr. Henry W. B. Glover, who has been Division Freight Agent of the system since 1889, has been placed in charge of the freight department. Mr. T. J. Anderson, Passenger Agent, will continue in charge of the passenger department of the lines. Mr. Glover has been connected with the freight department of the Seaboard Air Line for a number of years. Recently his office as Division Freight Agent has been in Atlanta, Ga.

—Mr. Cullen M. Stanton, Division Superintendent of the Baltimore & Ohio Southwestern, with headquarters in the city of Springfield, Ill., has tendered his resignation to take effect Dec. 1. Mr. Stanton entered railroad service June 1, 1864, as a telegraph operator, and has filled successively the positions of Telegraph Operator, Station Agent, Superintendent of Telegraph, Paymaster, General Freight and Ticket Agent, and Division Superintendent. Prior to Nov. 1, 1893, he was in the service of the Ohio & Mississippi Railway, five years as General Freight and Ticket Agent of the Springfield Division, and 18 years as Superintendent of the Illinois divisions.

—Mr. Enoch Lewis, who has been in the service of the Pennsylvania Railroad Company since 1850, 26 years of which time he has been the Purchasing Agent, has tendered his resignation, to take effect on Dec. 1, when he will complete 43 years of service. The directors of the Pennsylvania, in accepting the resignation, adopted a minute expressing the Board's appreciation of the faithful service given by Mr. Lewis in the various positions held by him.

Mr. Lewis began his apprenticeship at the age of 15 with Eastwick & Harrison, locomotive builders, of Philadelphia, and remained with them from 1836 until he became of age in 1842. In 1844, in the employ of Eastwick & Harrison, he went to Russia to take charge of a shop at Alexandroffsky near St. Petersburg, and superintend the building of some cars for the St. Petersburg & Moscow Railroad. He remained there two years and a half, returning to the United States in 1846. Between 1846 and 1850 he filled the position of foreman, first in a general machine shop at Trenton, N. J., and afterward at Ballardvale, Mass., where he had charge of the manufacture of locomotives and machine tools. In December, 1850, he entered the service of the Pennsylvania Railroad, taking charge of the roundhouse and repair shop at Mifflin. In 1851 he went into the office of Herman J. Lombard, then Superintendent at Harrisburg, and on Dec. 1, 1852, was made Second Assistant Superintendent of the Pennsylvania Railroad in charge of the Middle Division and of the motive power of the road, being located at Altoona. This position he resigned in 1857 to enter the employ of Messrs. A. Whitney & Sons, car wheel manufacturers, remaining with the firm two years and a half. He returned to the service of the Pennsylvania Railroad in April, 1860, as General Superintendent of the road, which position he filled throughout the War of the Rebellion, resigning Dec. 31, 1865, because he felt the necessity of rest after the strain of work throughout the war. On May 1, following, the position of Purchasing Agent, Pennsylvania Railroad, was created and given to Mr. Lewis, which position he has held continuously since that date.

ELECTIONS AND APPOINTMENTS.

Baltimore & Ohio Southwestern.—C. H. Howard has been appointed Superintendent of the Parkersburg-Cincinnati Division, the main line of the old Baltimore & Ohio Southwestern. E. R. Scoville will be Train Master, and George Plumley Chief Train Dispatcher.

Bellefonte Central.—Martin E. Altenderfer, of Jersey Shore, Pa., will have charge of the auditing department, with headquarters at Bellefonte, Pa. Mr. Altenderfer has been clerk in the joint office of the Beech Creek and Fall Brook at Jersey Shore, Pa., for three years.

Central Vermont.—Directors were elected in St. Albans, Vt., as follows: E. C. Smith, of St. Albans; James R. Langdon, of Berlin; B. P. Cheney, of Boston; W. H. H. Bingham, of Stowe; L. J. Seargeant and Robert Wright, of Montreal; John Bell, of Belleville, Ont.; William Seward Webb, of Shelburne; B. B. Smalley, of Burlington; F. Stewart Stranahan, of St. Albans, and Robert Coit, of New London, Conn.

Chicago & Erie.—At the annual meeting held in Huntington, Ind., Nov. 14, the following directors were elected: J. G. McCullough, John King, E. B. Thomas, G. H. Vaillant, A. Donaldson, Andrew W. Kent, Samuel Spencer, James H. Benedict, of New York City; M. A. Hanna and John Todd, of Cleveland; M. D. Woodford, of Cincinnati; Volney T. Malott, of Chicago, and Simon Perkins, of Sharon, Pa.

Cincinnati, Portsmouth & Virginia.—John C. Gleason has been appointed Superintendent of Transportation and H. L. Stroupe Chief Train Dispatcher.

Knoxville & Ohio.—At the annual meeting held in Knoxville, Tenn., Nov. 8, the following directors were elected: Samuel Thomas, Calvin S. Brice, Edward J. Sanford, John G. Moore, Charles M. McGhee, E. R. Chapman, John Greenough, L. M. Schwan and Henry Fink.

Manhattan (Elevated).—The annual meeting was held in New York City on Nov. 8. The following were elected directors: George J. Gould, Russell Sage, Samuel Sloan, R. M. Gallaway, J. Pierpont Morgan, Edwin Gould, Frank K. Hain, George Bliss, Donald Mackay, G. P. Morosini, Simon Wormser, Joseph Eastman, Howard Gould. George J. Gould was elected President; F. K. Hain, Second Vice-President; and D. W. McWilliams Secretary and Treasurer.

Minneapolis, St. Paul & Sault Ste. Marie.—Edward V. Skinner has recently been appointed General Eastern Agent of this road, with headquarters at 353 Broadway, New York. He also represents the Canadian Pacific and Duluth, South Shore & Atlantic roads in a similar capacity.

Raleigh & Augusta.—The annual meeting of this company and the Raleigh & Gaston were held in Raleigh, N. C., Nov. 9, and the following directors were re-elected: R. C. Hoffman, Louis McLane, Baltimore, Md.; W. W. Chamberlain, Portsmouth, Va.; W. J. Hawkins, J. B. Batchelor and R. S. Tucker, Raleigh, N. C. The officers elected were: R. C. Hoffman, President, Baltimore, Md.; John C. Winder, Vice-President and General Manager, and John H. Sharp, Treasurer.

Seaboard Air Line.—H. W. B. Glover, Division Freight Agent, has assumed charge of the Freight Department, the Traffic Manager having been granted a leave of absence. T. J. Anderson, Passenger Agent, will continue in charge of the Passenger Department, both reporting to the Vice-President and General Manager. W. L. O'Dwyer, Chief Clerk to the Traffic Manager, has been transferred to Atlanta to assume the duties of Mr. Glover as Division Passenger Agent.

Toledo & Ohio Central.—C. L. Sprague has been appointed General Agent of the passenger department, a new office, with headquarters at Columbus, O.

RAILROAD CONSTRUCTION
Incorporations, Surveys, Etc.

Addison & Pennsylvania.—The work of changing this road from 3 ft. to standard gauge has been completed, and the first standard gauge train was run over the line on Nov. 13. The road extends from Addison, N. Y., to Galeton, Pa., 46 miles.

Alpena & Northern.—A company of this name filed its charter in Michigan last week with a capital stock of $700,000, the principal office being at Alpena, Mich.

Berwind-White Coal Co.—Surveyors are running a preliminary survey for a line from South Fork, Pa., into the territory along Stony Creek, in Cambria County. The company backing the enterprise has considerable coal lands in the immediate vicinity of Paint Creek.

Duluth & Winnipeg.—A contract has been let for a 14-mile branch to the Diamond mine, on the west Mesaba range in Minnesota. The Diamond mine has been at work several years, but has not heretofore made such a showing as to encourage the railroad company. This road will also build to the Mesaba Chief mine and the village of Hibbing.

Excelsior Springs.—The stockholders of this new road have voted to issue bonds to the amount of $150,000 on the line now in operation. This is about 10 miles long between Excelsior Springs and Clay City, Mo., and connects the Chicago, Milwaukee & St. Paul and the Wabash road, the road being operated by the latter company.

Great Northern.—A party of engineers, under charge of the same chief who a year ago ran several lines for the Great Northern's new direct link from western Minnesota to the head of Lake Superior, has just started out from Duluth westerly along the Mesaba range toward Tosstown, where the Great Northern swings south from a direct line to Duluth and Superior,

Great Salt Lake & Hot Springs.—The work on the extension beyond Bountiful, nine miles from Salt Lake City, to which point the road is now in operation, has been pushed with energy recently in order that the line might be completed before winter. The work now under way is a six-mile line to Centreville, Utah, and there is little doubt that the work will be completed as far as that town before it will be necessary to suspend the work on account of the weather. H. S. Joseph, of Salt Lake City, is Chief Engineer.

Mexican Roads.—Francis H. Woodhouse, of England, has obtained a concession for constructing a road from a point on the Mexican (Vera Cruz) Railway, between the stations of Guadalajara and Apizaco, to the iron works to be established in the municipality of Zacatlan.

Mississippi River & Bonne Terre.—The standard gauging of this road, which has been going on during the summer, is now practically completed on the 50 miles of road now in operation. The road is owned by the St. Joseph Lead Co., and was built in 1890 to facilitate the transportation of the products of that company. The line is now completed from Riverside to Doe Run, Mo.,. At Riverside it connects with the St. Louis, Iron Mountain & Southern, and that connection gives an entrance to St. Louis.

Ohio & Mississippi.—The short branch into Bedford, Ind., is now ready for operation, and in fact the construction work has been practically completed for some time except the erection of the station at Bedford, which is now being built. The new line is only four miles long and begins at Mitchell Hollow, reaching the extensive stone quarries at Bedford, Ind.

Path Valley.—Over 100 men are now at work on the extension and about three miles of road-bed have been graded up to date. Grading was begun at Dry Run, Pa., this week. It has been decided to further extend the extension from Dry Run to Fannettsburg, a distance of eight miles, and a survey is being made now. This extension will take the line through the villages of Spring Run and Willow Grove. An 1,800-ft. tunnel will be necessary through the Conocheague Mountain. The line now building is from New Germantown to Dry Run, 15 miles. David Gring, of Newport, is President.

Pittsburgh & Lake Erie.—The short branch connecting the main line at West Ellwood to Ellwood City, Pa., has been completed.

Revelstoke & Arrow Lake.—It appears that but 10 miles of this road is to be completed this year. This will not take the road to Arrow Lake, the temporary terminus being located at a point on the Columbia River some miles north of the lake, but as the river is navigable it will afford the Canadian Pacific a line into the Kootenai mining district in British Columbia, which will be open except for two months during the severest part of the winter. The branch leaves the Canadian Pacific at Revelstoke, B. C., and then proceeds south along the Columbia River to the northern end of Arrow Lake, the total length of the proposed branch being 28 miles. The contractor for the work now under way is D. Gillivray, of Vancouver, B. C. The grading and tracklaying will be finished in the first week of December. The engineer in charge is A. F. Stewart, at Revelstoke, B. C.

Rocky Mountain.—This company has applied to the Dominion Parliament for an extension of time in which to build the road from Calgary, or a point on the Calgary & Edmonton road near that station, or from a point near Calgary on the line of the Red Deer Coal & Railway Company's road, now under construction to the Red Deer Forks coal mines.

Sandersville.—A charter has been secured in Georgia for this line, which is to be about three miles long between Sandersville and Tennille, Ga. John N. Gilmore, of Sandersville, is one of the incorporators, and he asserts that the road will certainly be built. The Sandersville & Tennille owns a road between these points and has never made any remarkable record for the amount of dividends paid its stockholders. Some months ago this line was leased by the Augusta Southern road and some changes were made in the time-table, which, it appears, are not satisfactory to some of the citizens of Sandersville, and certain of them have incorporated a new company so that trains will be run more to their ideas.

Sugar Land.—This road, which was built by Cunningham & Miller as an outlet from the sugar plantation and refinery operated by the firm to the International & Great Northern, has been completed and is now open for railroad traffic. It is 13 miles long, extending from Sugar Land station, Tex., on the Southern Pacific line, to Arcola Junction, where connection is made with both the International & Great Northern and the Gulf, Colorado & Santa Fe.

Valdosta Southern.—The Florida Midland & Georgia road, which did some work a few years ago in grading a line between Valdosta, Ga., and Madison, Fla., has changed its name as above. J. M. Wilkinson, of Valdosta, is one of the most interested in the new company, which, however, does not seem to be yet prepared to do much in the way of actual work in completing the grade between the towns named.

Wilkes-Barre & Eastern.—This week the company began the shipment of coal over its new line from Wilkes-Barre to Stroudsburg, Pa., and in a few months, when the roadbed has become sufficiently settled, passenger trains will be put on.

Wilmington & Weldon.—The progress of the extension now under way between Remini, near Sumter, S. C., and Denmark, has been recently noticed in these columns. The officers state that all the contracts for construction work are to be completed by Jan. 1 next. The only heavy work will be the bridge erection. Three iron bridges are to be built; one over the Santee River near Remini, 600 ft. with a draw span; a 100-ft. span over the North Edisto River and a structure of 100 ft. span over the South Edisto. There is about 22,000 ft. of trestle work to be built, Watkins & Hardiway having that contract. The iron bridges are being built by the Edge Moor Bridge Works. E. J. Moorman & Co., of Lynchburg, are doing the grading, and I. E. O'Hearn & Bro. have the masonry work. The line will be 44 miles long, from Remini to a connection with the South Bound at Denmark, where the junction will be made, being a station about 50 miles south of Columbia. Col. F. A. Gardner, Engineer of the Atlantic Coast Line, is in charge of the construction work.

GENERAL RAILROAD NEWS.

Central of Georgia.—Receiver H. M. Comer has prepared the annual report of the operations of the company for the year ending June 30. The published summary gives only the following figures: Gross earnings, $7,823,125; operating expenses, $6,967,853; net earnings, $855,272.

Cleveland, Akron & Columbus.—At an adjourned meeting of stockholders held at Columbus, O., Sept. 11, it was decided to issue $4,000,000 of five per cent. bonds to run 50 years. The proceeds are to be used as follows: For taking up outstanding first mortgage bonds, $1,800,000; for redeeming second mortgage and equipment bonds, $730,000; for betterments and other expenses, $1,470,000. The stockholders had heretofore authorized (under the old management) an issue of $890,000 of second mortgage and equipment bonds, but only $730,000 were issued. Of the 40,000 shares of stock in the company, all but nine were voted. Judge Harmon, of Cincinnati, representing the American stockholders, voted in favor of the proposition to issue the new bonds, and W. O. Henderson, of Columbus, representing the Amsterdam, Holland, syndicate, voted 19,983 shares against the proposition, which thus carried by the votes of 35 shares.

Cleveland & Southwestern.—The articles of consolidation between this road and the Cleveland, Lorain & Wheeling have been filed, and give the capital stock at $13,000,000.

Colorado Eastern.—The road is to be sold under foreclosure sale on Jan. 31 next under an order secured by the Knickerbocker Trust Co., of New York, which is the trustee of the first mortgage six per cent. bonds. The company operates 17 miles of road running into Denver, Col., and owns over 3,000 acres of land in Colorado. The terminals in Denver are valuable, but the company has been involved in considerable litigation with the Union Pacific for the last two or three years over the right of the company to use them.

Evansville & Terre Haute.—The directors have passed a resolution increasing the capital from $3,000,000 to $4,000,000 and declared a script dividend of $1,000,000, convertible into the increased capital on payment of $20 per share of the new capital. The unsubscribed stock will be sold at auction Dec. 26. A previous resolution of the directors increasing the capital stock to $6,000,000 was rescinded.

Illinois Central.—The earnings from traffic for the three months ending Sept. 30, 1892 and 1893, are given in the following table:

	1893.	1892.	Inc.
Miles oper.....	2,888	2,888	
Gross earn.....	$5,869,409	$4,803,407	$1,066,002
Oper. expen. and taxes....	3,898,941	3,722,086	176,855
Net earn.....	1,970,468	1,081,321	889,147

The gross receipts from traffic for the month of October, 1893, are estimated at $2,580,224, and the receipts for October, 1892, were $1,878,110, an estimated increase of $702,114.

Louisville & Nashville.—A special meeting of the stockholders of the company was held in Louisville on Nov. 8, when it was voted to increase the stock $5,000,000, making the total capital $60,000,000. The officers have not announced for what purpose the funds secured by the sale of the new stock will be used, and there is much newspaper speculation over the matter. It is said

that it will not be offered to stockholders at present, but will be reserved for possible contingencies in case the earnings of the road do not improve.

The comparative statement of earnings for the month of September shows the following results:

	1893.	1892.	Dec.
Gross earnings	$1,486,559	$1,907,125	$420,566
Oper. expenses	824,067	1,220,295	396,229
Net earn.	$662,492	$686,829	$24,337
July 1 to Sept. 30:			
Gross earnings	$4,697,404	$5,659,271	$961,867
Oper. expenses	2,967,404	3,645,319	677,915
Net earn.	$1,730,000	$2,013,952	$283,952

Louisville, New Albany & Chicago.—The directors have authorized the issue of 15,000 shares of the preferred stock now in the treasury to be offered to the stockholders at the price of $40 a share, the funds thus secured to be used to pay for the equipment purchased early in the year in anticipation of the World's Fair traffic. Each stockholder will be entitled to subscribe for the new stock to the extent of one eighth of his holdings. The directors believe that the increase in revenue will be more than proportionate to the increase in claims upon the net earnings of the company by reason of the new issue of stock. The earnings for the four months of the current fiscal year, from July 1 to Oct. 31, are as follows:

Gross earnings, four months (October partly estimated)	$1,363,881
Operating expenses and taxes (October partly estimated)	824,379
Net earnings	$539,502
Fixed charges (interest and rentals)	341,504
Surplus	$197,998
Add proportion of dividends on Chicago & Western Indiana stock	24,800
Total available for dividends	$222,798

The net surplus for four months is equivalent to nearly five per cent. upon the total amount of preferred stock, $4,500,000, which will exist after the issue of the 15,000 new shares.

The directors, in their statement to the stockholders, explaining the terms under which the new stock is issued, speak as follows about the condition of the property: "That a reasonable surplus applicable to the stock may be expected under normal conditions is evidenced by the report for 1893, when the facilities were less than at present, and yet a surplus of $180,182 was shown for the year ending June 30, 1893. The earnings of the road for that year per mile were: Gross, $6,499; net, $2,113; an amount which exceeds the earnings of many much more important systems extending west of Chicago. Both gross and net receipts have steadily increased since the close of last fiscal year. The bonded debt of your company is only $25,000 a mile, and it has no indirect obligations in the way of car trusts, terminal bonds, etc. Its facilities for doing business are for the first time adequate to meet the demands upon the company, and the recent improvement in the physical condition of the property, by the replacement of iron rails with steel and wooden bridges by iron, has been evidenced by a reduction in expenses as well as by an increase in gross receipts. The new freight house in Chicago, 500 ft. long, adjoining the Dearborn Street Passenger Station, will be completed within 30 days, and more than doubles the area available for the accommodation of Chicago freight. The additions to side tracks and equipment have very much facilitated the conduct of the company's freight business, and although the recent commercial disturbance has caused some diminution in this branch of its traffic yet the greater part of the reduction has been by the closing of the stone quarries in Indiana, which the owners are preparing to open in the spring to active employment as in the past."

Vice-President John Greenough, commenting upon the reclassification of the stock of that road, says: The action of the company in converting the $12,000,000 of the old common stock into $3,000,000 preferred and $9,000,000 common was based on the belief that the company could pay dividends on the preferred, and it is the policy of the company to pay dividends on this stock at the earliest possible moment. Each one per cent. dividend calls for only $30,000. For the past few months the company has averaged a net surplus above all charges and rentals more than this amount monthly. The dividend for the current half year has already been earned. The directors will undoubtedly pursue a conservative policy and not declare more at the start than there is a reasonable probability of being able to maintain.

New York Central & Hudson River.—The gross earnings of this road for the month of October are $4,350,291, an increase of $60,416 over the earnings for the same month of 1892. The earnings for 1893 are reported for an operated mileage of 2,334 miles, an increase of 238 miles over the mileage of last year.

New York & Northern.—The final argument in the attempted foreclosure of $3,200,000 of the second mortgage bonds of this road was held before Judge Dykman in the Supreme Court at White Plains, N. Y., last week. The controlling interests in this road are owned by the New York Central & Hudson River Railroad, and Simon Stern represented the minority bondholders in opposition to the foreclosure.

Northeastern (Georgia).—The Richmond & Danville has given notice of default on the November interest on the bonds of this road. These bonds are indorsed by the State of Georgia to the amount of $260,000. The road is 40 miles long and extends from Athens to Lula, Ga.

Philadelphia, Reading & New England.—The Central of New Jersey and the Philadelphia & Reading, will soon complete arrangements for using the tracks of the above company, including the Poughkeepsie Bridge. The current reports are that an arrangement is now being made between the three companies for a joint traffic agreement, each road to assume a fair proportion of the rentals. It is understood that for a limited period the net earnings of the road will be put into the property for betterments and that the rentals to be paid will be on an ascending scale.

Port Jervis, Monticello & New York.—This road was last week added to the list of the lines in the hands of receivers, by the appointment of the President, Benjamin Ryall, of Port Jervis, as Receiver. The order was made by Judge Brown, of the New York State court, on petition of a judgment creditor. The road is 41 miles long, extending from Port Jervis to Monticello, N. Y. A large part of its earnings comes from the large summer excursion travel to Sullivan County, and the freight earnings are very little in excess of passenger revenue. Recently the company has not been able to earn the interest on the floating debt in addition to the operating expenses and interest on the funded debt. The bonds now bear six per cent. interest, and it is proposed to reorganize the company, issue new bonds at a lower rate and to build new extensions down the Delaware River, which, it is thought, will bring considerable traffic to the road.

Sedalia, Warsaw & Southern.—The suit for a receiver for this property which was begun by the minority stockholders early in the summer was decided last week at Sedalia, Mo., against the Missouri Pacific which is now operating the road. James E. Thompson, of Sedalia, was appointed Receiver. The court seems to think that there was some justice in the charges of the minority stockholders that the road had been mismanaged and their interests not protected. The road is 43 miles long from Sedalia to Warsaw, Mo., and the present suit is apparently part of the plan of S. Dwight Treadway, of St. Louis, to cancel the present agreement with the Missouri Pacific so that the line might be operated as an independent line. It is proposed to then change the gauge to standard and extend the line to Springfield and other points.

Union Pacific.—On application of United States Attorney-General Olney, J. W. Doane, of Chicago, and Frederic R. Coudert, of New York, were this week appointed additional Receivers of the railroad, with as full power as the original three receivers. The application was consented to by the stockholders and other parties in interest.

TRAFFIC.

Traffic Notes.

The new Eastern elevator, at Buffalo, has just been completed. It can unload from vessels 45,000 bushels of grain an hour.

The coal mines of the Delaware, Lackawanna & Western are now all working on full time, giving employment to about 5,000 men.

On Nov. 5 the Chesapeake & Ohio ran an excursion from Charlestown, W. Va., and intermediate stations to Cincinnati. The round trip rate from Charleston was $3.50, the regular rate being $10.30 and from other points similar reductions were made. The tickets were good to return Nov. 6 and 7.

The Colorado Traffic Association, composed of the principal shippers and freight receivers of Denver, has closed its first year. It is said to have succeeded in accomplishing many changes in freight rates favorable to Denver. This year the efforts of Commissioner Janes will be directed toward stimulating trade with Mexico and the securing of rates to enlarge the distributing field of Denver merchants.

The Lehigh Valley announces that the through passenger trains between New York and Chicago, over the Lehigh Valley and the Grand Trunk, which have been run during the World's Fair, are to be made a permanent thing. A vestibule train will be run through each way daily. In one of the reports it is stated that the time through will be 27 hours. This is faster than any train by any of the other lines, except those on which the fare is $22, two dollars above the standard rate. The rate by the Lehigh Valley is $2 below the standard rate.

It is announced that the Lehigh Valley and the New York, New Haven & Hartford have joined in a through tariff for coal, the cars to be transferred from Jersey City to Harlem River on floats. The gossips say that the New Haven road has made this agreement to forestall a possible agreement between the Lehigh Valley and the New York & New England for carrying coal into New England by way of the Poughkeepsie Bridge and Hopewell Junction. It is said that the New Haven road will give the Lehigh Valley some of its through freight for the West.

The New York & New England, not to be outdone, announced on Tuesday that it had made a traffic agreement with the New York, Ontario & Western. It appears that coal has been shipped to New England by the Ontario road considerably in the past, but the transfer was by boat from Newburgh to Fishkill. This is sometimes interrupted in the winter and the new contract provides for sending the cars over the Pougskeepsie Bridge, the Ontario road delivering then to the Bridge route at Campbell Hall.

Sawn lumber shipments out of Lake Superior for October were the greatest in the history of the trade.—111,960,000 ft. The greatest quantity came from Ashland, which in 10 days shipped 40,000,000 ft. Shipments for the season from the canal, with November yet to hear from, were 522 million feet, or 10 million greater than the total for 1892. Nearly all this lumber goes to Buffalo and Tonawanda, though Chicago, Cleveland and Saginaw get part of it. Around Lake Superior are mills with an aggregate annual capacity for 900 million feet. Previous to 1892 Eastern shipments had never been over 360 million feet.

The New York, Susquehanna & Western has made a traffic agreement with the Lehigh Valley for the interchange of freight to and from the West. The main line of the Susquehanna road extends from Jersey City westward to the Delaware River, the present western terminus being at Gravel Place, near Stroudsburg. The new Wilkes Barre & Eastern extends from Stroudsburg northwesterly to Wilkes Barre, and the completion of this line is the occasion of the present contract, the Wilkes Barre & Eastern being controlled by New York, Susquehanna & Western interests. The contract covers only freight to and from local stations on the Susquehanna road, as the Lehigh Valley has a line of its own to Jersey City.

The Trunk Line Passenger Commissioner's office has given out the approximate totals of the World's Fair business from New York City. The sales of tickets to Chicago from April 25 to Oct. 30 aggregated 137,000, of which 42,000 were regular excursion tickets, 25,000 day-car excursion and 70,000 one-way tickets. The reporters figure out the earnings at $4,610,000 as follows (the average rates are too high): Estimating the one-way tickets at $20 each, the regular excursion at $30, and the day-car excursion at $18, the gross amounts received by the companies would be as follows:

	Tickets sold.	Average price.	Amount.
One way	70,000 at	$20	$1,400,000
Regular excursion	42,000 at	30	1,360,000
Day car	25,000 at	18	450,000
	137,000		$3,210,000

To this amount is added $1,400,000 for the return of passengers who bought one-way tickets, making the total receipts $4,610,000. Under normal conditions, the average number of passengers leaving New York daily over all lines for Chicago is about 200.

Chicago Traffic Matters.

CHICAGO, Nov. 15, 1893.

A report was current here last week that the Western lines had perfected an auxiliary agreement, or "Western Trunk Line Committee" to be placed in charge of Chairman Midgley of the Western Freight Association, to regulate freight rates. While such a plan would perhaps have advantages, I am in position to say that it has not as yet been consummated and the announcement of its completion is at least premature. As I said some weeks since there is apparently need of something of the kind.

The Ogdensburg Transit Company's boats stopped receiving freight on Nov. 11.

The Erie, in connection with the Norfolk & Western and the Atlantic Coast line, has opened a new through line from Chicago to Jacksonville, Fla.

The regular meeting of the Western Freight Association convened yesterday. Among the subjects under consideration are the following: Request for advance in minimum weight on livestock; import rates, New Orleans to Iowa points, including Missouri River point Omaha and north; proposed rate of $2.25 per net ton on soft coal, C. L., St. Louis to Omaha; uniform stock contract to be used by all lines; issuance of bills of lading at Kansas City before receipt of property; transfer charge on grain at Missouri River.

Advices from St. Louis state that the position of chairman of the Southwestern Traffic Association has been tendered to Mr. L. S. Day, Traffic Manager of the Mississippi Valley route, and the indications are that he will accept. If he does, nothing then remains to prevent the putting into immediate effect of the new agreement and the restoration of rates to a paying basis, which has been impossible so long as the organization of this association was incomplete.

A dispatch from St. Paul states that Chairman Caldwell of the Western Passenger Association has succeeded in bringing about an understanding between the transcontinental lines to restore passenger rates. Probably all the interested lines at heart wish this was true, but unfortunately there is no truth whatever in the statement, as no such trip has been made nor has any understanding yet been reached for a settlement of the disturbance, which, as will be remembered, originated in the action taken by the Great Northern upon the opening of its transcontinental line. It is not improbable, however, that the urgent necessity which now confronts all the lines for securing all the revenue possible may be the means of bringing about a willingness to let bygones be by-gones and restore the rates.

It is rumored that demands are being freely made on the Western roads by ticket agents for commissions on round trip World's Fair tickets, which, under the agreement of the Western Passenger Association, are not to be allowed on any tickets sold at less than one fare for the round trip.

The Great Northern has commenced to run tourist sleepers. This announcement has additional interest from the fact that the use of these cars by its competitors was one of the principal reasons given by that line for inaugurating the present reduced passenger rates to the Pacific Coast.

The shipments of eastbound freight, not including livestock, from Chicago, by all the lines for the week ending Nov. 11 amounted to 54,932 tons, against 57,855 tons during the preceding week, a decrease of 2,923 tons, and against 74,569 tons for the corresponding week last year. The proportions carried by each road were:

Roads.	W'k to Nov. 11.		W'k to Nov. 4.	
	Tons.	P. c.	Tons.	P. c.
Michigan Central	5,849	10.6	6,403	11.1
Wabash	3,849	7.0	4,051	7 0
Lake Shore & Michigan South.	9,981	18.2	10,011	17.3
Pitts., Ft. Wayne & Chicago	8,571	15.6	8,015	13.9
Pitts., Cin., Chicago & St. Louis	6,991	12.7	6,970	12.0
Baltimore & Ohio	3,460	6.3	3,336	5.8
Chicago & Grand Trunk	2,682	4 9	2,588	4.5
New York, Chic. & St. Louis	4,613	8.4	4,898	8.4
Chicago & Erie	6,515	11.9	7,530	13.0
C., C., C. & St. Louis	2,421	4.4	4,053	7.0
Totals	54,932	100.0	57,855	100.0

Of the above shipments 1,940 tons were flour, 21,357 tons grain and millstuff, 8,894 tons cured meats, 11,913 tons dressed beef, 1,113 tons butter, 2,563 tons hides and 3,562 tons lumber. The three Vanderbilt lines carried 37.2 per cent., the two Pennsylvania lines 28.3 per cent. The Lake lines carried 100,447 tons, against 72,483 tons during the preceding week, an increase of 27,964 tons.

(*Other Chicago traffic news will be found on page* 835.)

Meeting of the Joint Committee.

A meeting of the Joint Committee of the Trunk Line and Central Traffic associations was held at the Trunk Line rooms in this city, Nov. 9 and 10. Representatives of 23 roads were in attendance. The principal topic under consideration was the existing demoralization in export freight rates. It has been known for some time that these rates were in an extremely unsatisfactory condition, and the opening of the route via the Chesapeake & Ohio through Newport News has added to the disturbance. No progress was made in the general meeting and the question was referred to a committee consisting of representatives of the New York Central, Pennsylvania, Baltimore & Ohio, Grand Trunk, Lackawanna, Big Four, Vandalia, Nickel Plate and the Erie. This committee in their report virtually admitted their inability to agree upon a remedy for the evil, by recommending the recommitment of the whole subject to a committee of investigation. The meeting adopted the report; instructed the Commissioners to inquire into existing contracts with ocean carriers; reaffirmed the action of December, 1892, requiring the maintenance of the full authorized rates to the various ports as the inland proportions of through rates; and finally referred the whole subject back to the same committee, with the addition of a representative from the Chesapeake & Ohio, with instructions to consider it further and report at a subsequent meeting. According to the comments of some of the representatives present, everybody admitted the necessity for doing something to stop the spread of the demoralization, but no line appeared to place confidence enough in anybody to be willing to submit the matter with power to act; consequently, no substantial progress was made toward the solution of the question. The meeting adjourned after passing resolutions to strictly maintain all eastbound freight rates on and after Dec. 1; to maintain all passenger fares, both east and west bound, and to pay no commissions from Nov. 10 to March 1, 1894. A committee was also appointed to confer with Western lines in regard to divisions of through rates.